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NEUTRAL RAW WOOL SCOURING

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The principles of neutral raw wool scouring have been successfully and economically applied by the authors in the scouring of over fifty million pounds of wool of many types in a number of plants. The wool scoured by this method was much whiter, loftier, faster drying, had a kinder handle, and gave less noilage than that scoured by the conventional soap and soda method. This paper describes the laboratory and plant work done to establish the optimum conditions for scouring raw wool using a nonionic detergent and sodium sulfate as a builder. The relative effects of temperature, type of builder and detergent, and builder concentrations are discussed. A starting formula, based on laboratory results, was successfully applied in extensive field tests. Additions of detergent and builder, however, had to be worked out for each plant due to the differences in equipment, type of wool scoured, etc.

INTRODUCTION

WOOL has traditionally been scoured under alkaline conditions for generations, despite the recognized dangers of yellowing, harshening, tensile strength loss, and general chemical damage to the fiber due to its sensitivity to alkalies.

The desirability of scouring wool without the use of alkaline materials or, as it shall be referred to in this paper, neutral scouring, has been apparent to many textile technologists for at least twenty years.

In 1939, Elod and Rudolph (*1*) wrote: "The systematic investigation of the properties of wool protein and the mechanism of the common finishing procedures leads to the conclusion that these procedures should be redesigned to more fully take into account the properties of the wool protein in order to preserve to the fullest extent the valuable physical, chemical, and mechanical properties of the wool fiber." However, a substantial change in processing methods could not have been effected at that time due to the lack of suitable chemicals (from a price and availability standpoint) and because of the limitations imposed by equipment and/or technological know-how.

Prior to World War II, the most effective detergent available to the wool scourer at a reasonable cost, was soap. It was effective not only from the standpoint of its cleaning ability but also in the hand or feel it imparted to the fiber. Soap, properly used, also imparts softness and pliability to the wool. These are important considerations not only for aesthetic reasons but also from the standpoint of subsequent processing. Harsh, overscoured wool will not card well, increases noilage, and combs and spins poorly, despite the use of fiber lubricants. It has long been known that the condition of the wool on leaving the dryer after scouring will greatly influence the quality of the finished product into which it is made.

Soap alone, however, cannot do the job properly or efficiently. If it were used alone, in a raw wool scouring bowl, for instance, soap would be subject to the following:

1) Hydrolysis — which reduces the effectiveness of the soap.
2) Rapid exhaustion due to:
   a) Contaminants and grease brought in by the wool.
   b) The substantivity of soap to wool.
3) Precipitation due to hard water and contaminants (calcium and magnesium salts, etc) brought in by the wool.

Certainly these difficulties could be overcome by the addition of more soap, but the amounts needed would make the cost of the operation prohibitive. In order to increase the efficiency of the soap and reduce the amount needed, an inexpensive builder is required. Sodium carbonate (soda ash) has long been used to meet these requirements. Its functions are to:

1) Suppress hydrolysis of the soap.
2) Saponify the fatty acids in the wool grease to produce more soap, thus increasing the efficiency of the system.
3) Aid in the emulsification of the grease.
4) Partially reduce the detrimental effects of hard water and the contaminants brought in by the wool.
5) Reduce the absorption of soap by the wool.
6) Reduce costs by increasing the efficiency of the soap through synergistic action.

Although alkali is beneficial to the action of the soap, it is detrimental to the wool. As previously mentioned, it yellows, harshens, and weakens the fiber. Residual alkali in the stock can cause many problems in carbonizing, carding, spinning, weaving, dyeing, and finishing. These detrimental effects of alkali have been demonstrated repeatedly not only in the laboratory (*1, 2*) but also in actual practice. Thus, it appears logical that an effective and economical system of wool scouring in which the use of alkali is omitted would be useful.

Synthetic detergents have steadily decreased in price to the point where they have become economical for use in raw wool scouring.

A number of modifications of the soap and alkali scour have been proposed in the past and some of them have been used for a number of years. Most of these *substitute* a synthetic anionic detergent for the soap, although in recent years nonionics have also been used.

The anionic syndets, particularly the alkyl sulfate and alkyl aryl sulfonate types, have a number of important advantages over soap:

1) They do not hydrolyze under normal usage conditions.
2) Their efficiency is less impaired

by hard water than is soap.

3) They are generally more soluble and more readily dispersed than soap.

4) They are less sensitive to pH variation than soap.

These advantages and others, including better rinsability, lime soap dispersing ability, stability to rancidity, ease of handling, etc would appear to make it desirable to use anionic synthetic detergents in place of soap. It was found, however, that the use of an alkali was still required for economical processing and maximum efficiency *(3-6)*. The main reasons for this were:

1) Anionic synthetic detergents are generally more efficient under alkaline conditions.

2) As with soap, the alkali saponifies the fatty acids of the wool, thus increasing the efficiency of the system.

3) Anionic synthetic detergents exhibit much less substantivity for wool at higher pH's than they do under neutral or slightly acid conditions where they can be more substantive than soap.

4) The alkali aids the detergent in emulsifying the grease.

It is also known that the effectiveness of an anionic detergent-alkali system can be further improved by the addition of a salt such as sodium chloride or sodium sulfate *(3)*.

The above syndet systems do not, however, represent the most desirable departure from standard raw wool scouring procedures in that alkali still plays an indispensable part and because it has been found that anionic detergents in combination with alkali produce a much harsher fiber than soap and alkali. This latter disadvantage limited their use to those operations where fiber quality was secondary to processing efficiency. The situation is further complicated where a salt is used since this significantly increases the absorption of alkali by the wool.

Thus it appears that a detergent that does not require an alkali for optimum performance is required if an alkali-free or neutral scouring system is to be effective. It seems reasonable to expect a member of the nonionic class of detergents to meet this requirement, particularly one of the alkylaryl polyethoxyethanol type. Within certain molecular weight limits nonionics of this type are:

1) Superior emulsifiers under neutral and even acid conditions.

2) Nonhydrolizing.

3) Nonsubstantive.

4) Not adversely affected by hard water and calcium and magnesium salts.

5) Effective over a wide pH range.

6) Good lime soap dispersants.

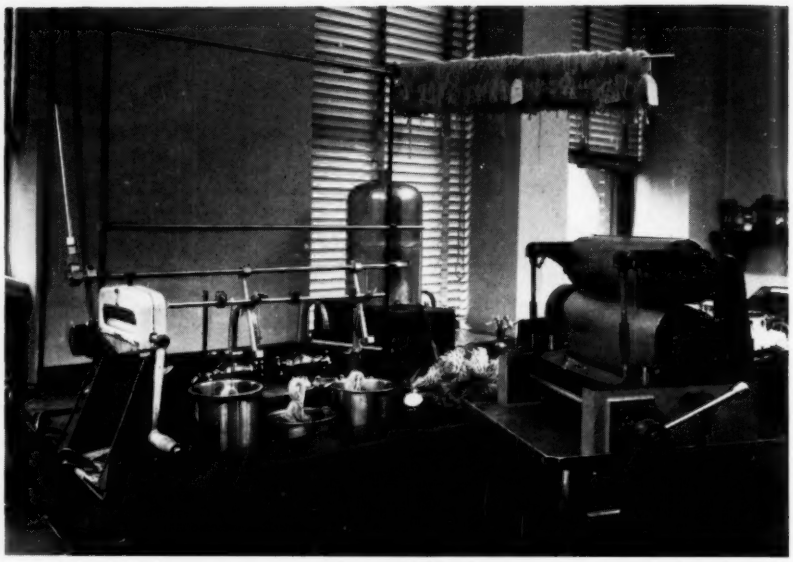

Figure 1
Laboratory three-bowl scouring apparatus

7) Economically priced.

In addition, they dissolve readily, are stable to rancidity, and are free rinsing.

A number of workers have reported on the use of nonionics in the scouring of wool, both in raw stock and subsequent stages *(3-8)*. In most instances, the nonionic is used merely as a substitute for soap, however, and alkali is still present in the system.

In only a few of the cases that have come to the attention of the authors is alkali omitted entirely and replaced by a neutral electrolyte as the builder *(6, 7, 9)*. Of these only LaFleur *(7)* presents systematic laboratory data in support of his contentions. His work, however, was carried out on woolen cloth soiled with a self-emulsifying mineral oil, and does not bear on the problem of removing the natural soil and grease from raw wool.

The apparent lack of published data clearly indicating the controlling factors of a neutral raw wool scouring system and their relative importance prompted this investigation. The work was carried out in two stages: Laboratory investigation and field tests.

LABORATORY WORK

The laboratory work reported here was carried out as a short-term project aimed at determining the optimum conditions for a neutral raw wool scouring system, using a nonionic detergent* of the alkylaryl polyethoxyethanol type.

TEST METHOD—The AATCC Tentative Test Method 64-52 for the "Evaluation of Continuous Scouring of Raw Grease Wool" (described on pages 129-131 of the 1955 AATCC Year Book) was used in studying the effects of variables such as detergent and builder concentration, temperature, etc on the grease removing efficiency of the system. A number of minor modifications were introduced into the method; namely,

1) Ten-gram skeins rather than five-gram skeins of grease yarn were used.

2) A separate squeeze roll was used for the skeins emerging from the scouring bowl in order to facilitate returning the squeeze liquor to that bowl.

3) Residual grease determinations were made by means of ethyl ether extractions in the Soxhlet apparatus in place of the carbon tetrachloride—cup and plunger method.

4) The residual grease content was based on the scoured, conditioned (20-30% relative humidity) weight of the skein rather than the grease weight.

The apparatus used in this study is pictured in Figure 1 and comprises a three-bowl system. The power driven padder (lower right) was used on the skeins emerging from the suint and rinsing bowls (center and right hand stainless steel beakers respectively) while the skein from the scouring (left hand beaker) was put through the hand wringer which returned the liquor squeezed from the

* Kyro EO (Registered trademark)

skein to the bowl. The aluminum bottle (center) fed a continuous supply of distilled water to the rinsing bowl which in turn overflowed into the desuinting bowl. The skeins were lowered into the bowls by allowing the horizontal rod from which the glass hooks are suspended to slide down. A reciprocal motion was then imparted to the immersed skeins by activating the long lever (far left). After thirty seconds, the skeins were lifted out of the bowls, put through their respective squeeze rolls and passed on to the next bowl, or, in the case of the rinsed skeins, hung on the horizontal bar (upper right). Unless otherwise noted, no additions of detergent or builder were made during a particular run.

The grease yarn used in preparing the skeins was obtained from the Secretary of the AATCC. It was marked Wool Lot No 2 and was found to have an average grease content of 4.2% on a grease weight basis.

TEST CONDITIONS—The preliminary work consisted of finding the most sensitive conditions of temperature and detergent concentration for the test method and then determining its reproducibility.

A number of scouring runs were made with several different detergents (both nonionic and anionic), with and without builder at different levels of temperature and active detergent concentration. The greatest differences in grease removal between detergents and detergent systems were obtained at a temperature of 165°F and a detergent concentration of 0.10% (on a solution weight basis).

A number of duplicate or check runs on various detergent and detergent-builder combinations indicated that the method had exceptionally good reproducibility. Check runs were made from time to time throughout the duration of the program to assure operator, procedure, and test specimen uniformity.

RESULTS AND DISCUSSION

SCOURING EFFICIENCY AS A FUNCTION OF NONIONIC DETERGENT CONCENTRATION — Grease removal efficiency as a function of detergent concentration was studied by making four runs at various levels of detergent concentration (no builder). The percentage figures labeling the curves in Figure 2 indicate the detergent concentration of the scouring bowl liquor.

As can be seen, the effect of detergent concentration is two-fold. As it is increased, 1) the residual grease level is lowered, and 2) the rate of exhaustion is reduced.

These results agree well with reports from the field about plant trials where nonionics were used in an unbuilt system. It was found in these cases that a high initial concentration of detergent was required for proper scouring.

It is interesting to note that at the 165°F temperature, water alone (0.0% curve) removes somewhat more than half of the total grease present in the wool.

SCOURING EFFICIENCY AS A FUNCTION OF THE TYPE OF BUILDER USED—The data shown graphically in Figure 3 indicate clearly the remarkable effectiveness of sodium chloride (NaCl) and sodium sulfate or Glauber's salt (Na_2SO_4). A comparison of these curves to the 0.10% concentration curve in Figure 2 illustrates the full magnitude of the effect. The addition of either sodium chloride or sodium sulfate is more effective than doubling the detergent concentration.

Urea appears to have little effect on the efficiency of the system, while magnesium sulfate (Mg_2SO_4) is decidedly detrimental. Monosodium orthophosphate (NaH_2PO_4) on the other hand is intermediate in effectiveness between urea and sodium chloride. It was noted that the skeins scoured with the orthophosphate builder were exceptionally white, giving the appearance of having been bleached.

Although time limitations did not permit it during this study, it would have been interesting to investigate the effect of combinations of monosodium orthophosphate and either sodium chloride or sodium sulfate, not only from the standpoint of improved color of the scoured wool but also from the standpoint that the phosphate (pH 4.2) would maintain the pH of the system near the iso-electric point of wool. Since at this pH, wool is least reactive and therefore less susceptible to damage, a still better grade of scoured stock should result.

SCOURING EFFICIENCY AS A FUNCTION OF SODIUM SULFATE OR SODIUM CHLORIDE CONCENTRATIONS—In order to determine the optimum concentration of sodium chloride or sodium sulfate, a number of runs were made at various levels of salt concentration while maintaining the amount of detergent constant throughout. The percentage figures labeling the curves in Figures 4 and 5 indicate the builder concentration of the scouring bowl liquor.

The data show that at the 0.10% detergent level and at 165°F the optimum concentration of salt is in the neighborhood of 0.10% for sodium chloride and 0.20% for sodium sulfate. As the amount is substantially increased beyond 1.0%, the scouring efficiency is considerably reduced.

Hepworth *(3)* states that 15 to 18 times as much salt as nonionic, below a total of 1%, is recommended. This appears to be borne out by the results of the present work (see Figure 5), inasmuch as concentrations of sodium chloride at the 1% level and above decrease the efficiency of the system. According to Zimmerman *(9)*, the optimum salt concentration is dependent on the particular nonionic used. This is reasonable since it is believed that the effect of the salt is to encourage micelle formation and thus force more of the detergent to the oil-water interface. The optimum salt concentration is thus a function of the solubility (cloud point) of the detergent. By the same token, however, the particular salt used, the temperature of the scouring liquor, and the detergent concentration must also play a part.

At or near the optimum level there appears to be no substantial difference between the effectiveness of the sodium chloride and sodium sulfate. On this basis and from the standpoint that in practical application sodium sulfate absorbed by the wool would be more helpful in dyeing than sodium chloride, sodium sulfate was chosen for all further testing.

SCOURING EFFICIENCY IN A BUILT SYSTEM AS A FUNCTION OF NONIONIC DETERGENT CONCENTRATION—In order to study the effect of the sodium sulfate builder on scouring efficiency at various levels of detergent concentration, the runs plotted in Figure 6 were made. The percentage figures labeling the curves indicate the concentration of detergent in the scouring bowl liquor.

A comparison with Figure 2 indicates that 1) the effect of changes in detergent concentration are minimized in the presence of the builder and 2) the builder tends to promote more uniform scouring, particularly at the lower detergent concentrations. The primary effects of the builder, namely, lowering the residual grease level and reducing the rate of exhaustion are, of course, also in evidence.

SCOURING EFFICIENCY IN A BUILT SYSTEM AS A FUNCTION OF TEMPERATURE—The runs plotted in Figure 7 were made in order to evaluate the effect of temperature on the scouring efficiency of a system containing 0.10% detergent and 0.20% sodium sulfate.

It is evident that the higher the temperature, the more efficient the system. As in the case of the other three variables (detergent concentra-

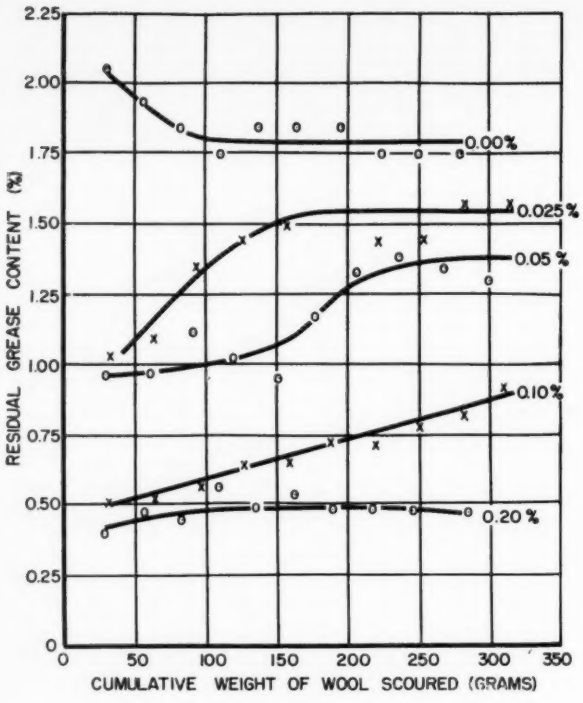

Figure 2

Scouring efficiency as a function of nonionic detergent concentration at 165°F.

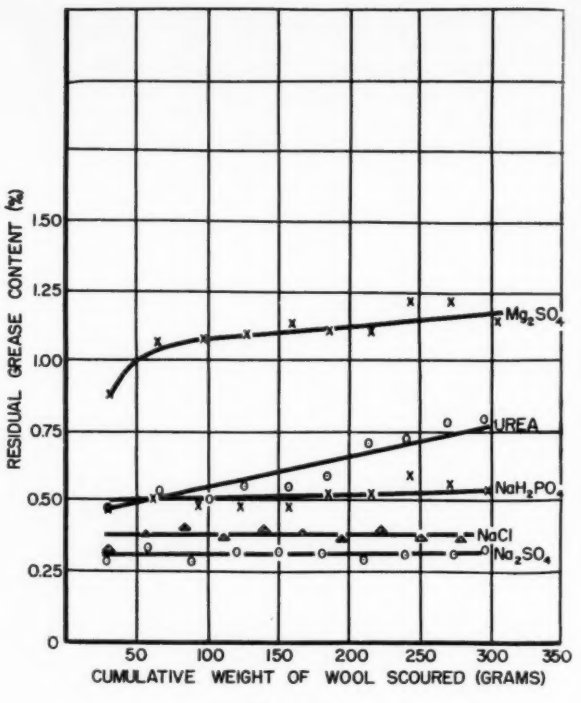

Figure 3

Scouring efficiency as a function of the type of builder, using 0.1% nonionic detergent and 0.2% builder at 165°F.

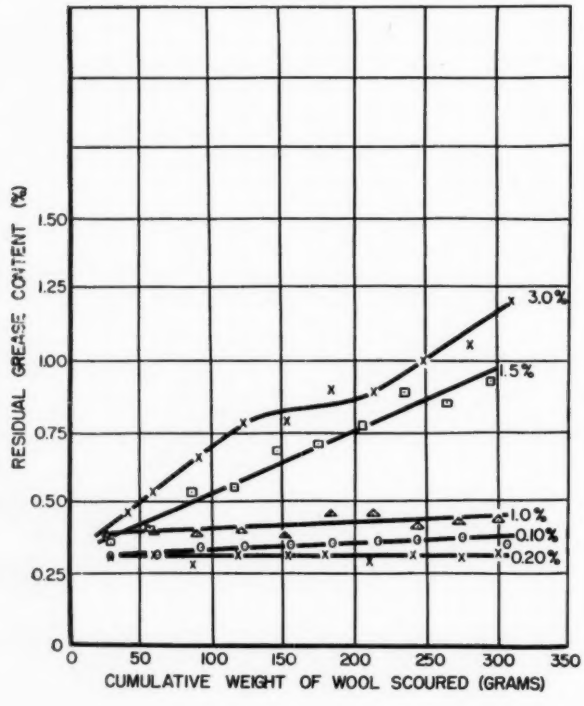

Figure 4

Scouring efficiency as a function of sodium sulfate concentration, using 0.1% nonionic detergent at 165°F.

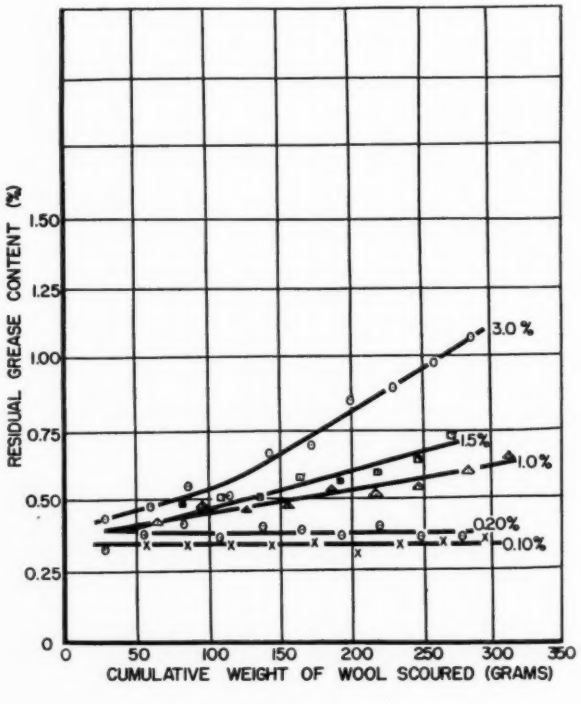

Figure 5

Scouring efficiency as a function of sodium chloride concentration, using 0.1% nonionic detergent at 165°F.

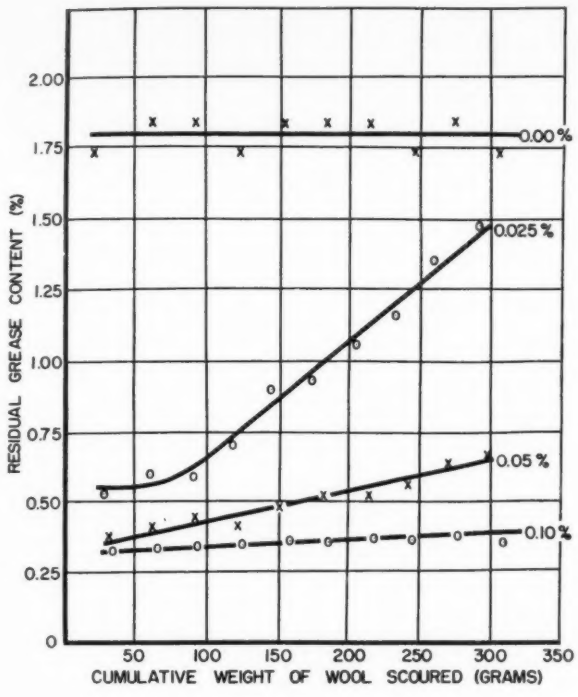

Figure 6
Scouring efficiency in a built system as a function of nonionic detergent concentration at 0.2% sodium sulfate and 165°F.

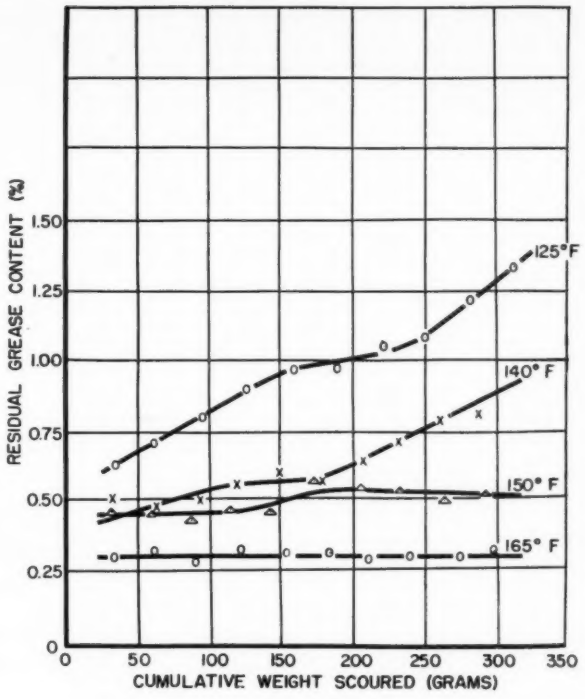

Figure 7
Scouring efficiency in a built system as a function of temperature at 0.1% nonionic detergent concentration, 0.2% sodium sulfate

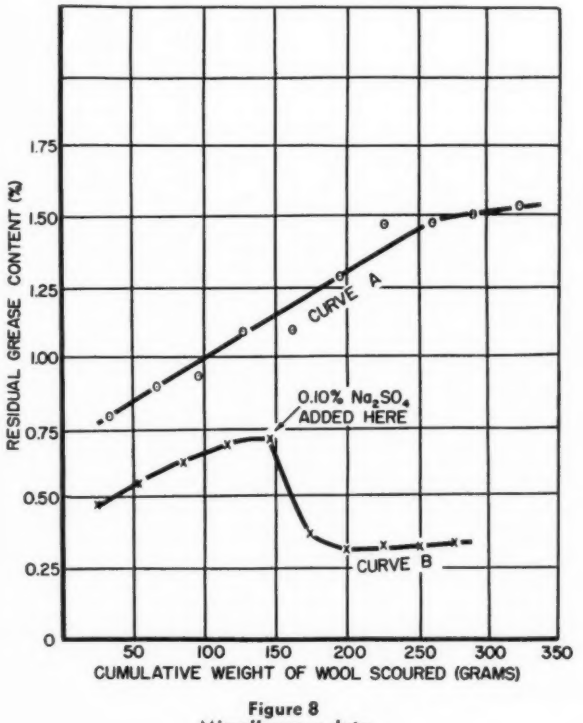

Figure 8
Miscellaneous data

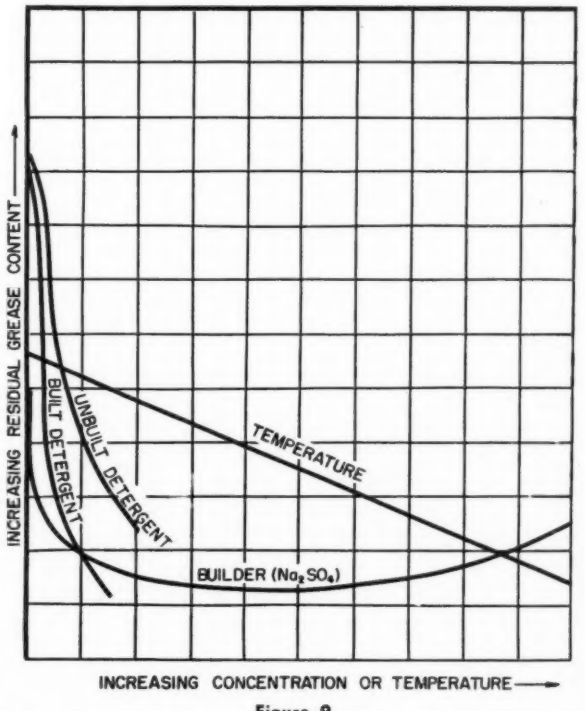

Figure 9
Summary of the effect of temperature and detergent and builder concentration on residual grease content

tion, type of builder, and builder concentration), the effect of temperature is to modify the residual grease level as well as the rate of exhaustion of the system.

MISCELLANEOUS DATA—Curve A in Figure 8 represents the results of a soap and soda ash scour (0.15% low titer soap, 1.25% soda ash) at 140°F and is included for purposes of comparison to the other scouring methods. A comparison of Curve A to the 140°F curve in Figure 7 points up the much greater efficiency of the neutral scouring method. It seems reasonable to assume that this superior efficiency alone could make the neutral scouring system more than competitive with the regular soap and soda scour. Moreover, there seem to be a number of other advantages to be gained from this method. On comparing the skeins scoured by the soap-soda method to some scoured at 140°F with 0.10% nonionic and 0.20% sodium sulfate, the ones scoured by the latter method were found to be much whiter, softer feeling, and quicker drying. These advantages have also been reported by other workers in the field *(6, 9)*.

Curve B dramatically illustrates the effect of sodium sulfate as a builder. In this case, a run was started using only 0.10% nonionic; partway through the run, 0.10% sodium sulfate was added. The resultant drop in residual grease is clearly illustrated.

SUMMARY OF EFFECT OF TEMPERATURE AND DETERGENT AND BUILDER CONCENTRATION ON RESIDUAL GREASE CONTENT—Figure 9 illustrates the effect of these variables on residual grease content rather than scouring efficiency as a whole. Scouring efficiency is determined not only by residual grease content but also by the rate at which it increases with increasing amount of wool scoured. The points used in plotting these curves were taken from Figures 2, 4, 6, and 7 at the 250 g level (on the X axis). In view of the data, the following conclusions seem warranted:

1) The relationship between temperature and residual grease content is approximately linear.

2) The effect of increasing detergent concentration is very marked in the range of 0.0% to 0.20% especially in the built (sodium sulfate) system.

3) The sodium sulfate concentration is at an optimum in the range of 0.20% to 0.50% at a detergent concentration of 0.10%. Using too much sodium sulfate (above approximately 2.0%) can result in residual grease figures that are higher than those obtained with no builder at all.

SUMMARY OF LABORATORY RESULTS

1) The nonionic-sodium sulfate (or sodium chloride) system represents an excellent method of scouring raw wool. It apears to be more efficient than the soap and soda method and produces whiter, softer, and faster drying wool.

2) The neutral scouring method affords four means of controlling scouring quality; namely, detergent concentration, type of builder, builder concentration and temperature. This makes this system particularly adaptable over a wide range of operating conditions, since so many means of *effectively* controlling scouring efficiency are available. It should be emphasized that temperature is much more of a controlling factor in neutral scouring than in the alkali-containing systems since the presence of alkali usually limits operating temperatures to below 130-140°F due to the severe damage done to wool at higher temperatures. The limits imposed on temperature in the neutral system are dictated mainly by the limitations of equipment or economic considerations. It is not recommended, however, that the system be operated above 180°F since at these temperatures some types of wool might be damaged.

3) On the basis of the soft handle of the wool scoured by the neutral method, even when the grease content was very low, it appears that overscouring is not a danger with this system.

4) Sodium chloride and sodium sulfate appear to be about equally effective as builders. Where dyeing, subsequent to scouring, includes the use of Glauber's salt, however, it may be more advantageous to use sodium sulfate in the scouring operation.

FIELD TESTS

In order to substantiate the promising laboratory results and to translate the data into terms more useful from a practical standpoint, extensive field tests were carried out. These tests were performed in a number of plants under widely varying conditions (number and size of bowls, etc) and with a large variety of wools ranging from carpet wools to domestic and Australian combing stock. Altogether, approximately fifty million pounds of wool were scoured.

The rates of detergent and builder addition necessary for continuous scouring are dependent on the types and origin of the wools being scoured as well as the feed rate. Some wools are easily scoured and others of approximately the same shrinkage characteristics are much more difficult to clean. It was impractical to try to determine these variables in the laboratory; therefore, they were worked out in actual, full scale plant production.

Other factors which had to be taken into consideration were the use of suint bowls and/or continuous grease recovery systems as well as equipment, condition of equipment, control, availability of steam, water, etc.

The principles of neutral scouring as determined in the laboratory were successfully applied in full scale plant production in four different scouring plants.

Plant No. 1—This plant was connected with a carpet mill and scoured all types of carpet wools. The equipment consisted of both four- and five-bowl trains of 48″ width. There was no suint bowl or grease recovery system.

Parallel tests were run in order to compare the nonionic detergent—Glauber's salt method to their regular soap and soda ash scour. The neutral scour was run in the four-bowl train while soap and soda ash were used in the five-bowl train.

Shortly after operation was begun, it was found that the neutral scoured wool was considerably whiter, loftier, and better feeling than that scoured by the soap and alkali method. As the neutral scouring progressed, it was noticed that the stock was much more open, lofty, resilient and drier than normal. As a result, it was found that the dryer could be operated at a temperature 20° below that normally used to obtain the moisture content necessary for proper carding. The grease content of the neutral scoured wool averaged 0.4% with a maximum deviation of ±0.2% and the kind handle and resilience of the stock were very noticeable.

This particular plant operated on the basis of approximately 60% grease removal in Bowl #1 and 40% in Bowl #2 primarily to save on chemicals since sludge dropping and bowl changes were most frequent in Bowl #1. The suds level ran appreciably higher than is normally expected due to the use of high velocity circulating pumps.

The procedure shown in Table I was worked out for this particular mill and gave good results.

Plant No. 2—This was a commission house handling all types of wool and operated with five bowl trains. Scouring had to be done in the first two bowls, rinsing in the third and fourth bowls, and bleaching in the fifth. Here again, there was no grease recovery system or suint bowl. The bulk of the grease (80%) had to be removed in the first bowl. (See Table II).

TABLE I

Procedure at Plant No. 1

4 bowl—48" train—2400 lbs grease wool per hour feed rate

Bowl	*Initial Charge*	*Additions Each 30 Minutes*
Bowl #1 2600 gals 145°F	20 lbs Nonionic detergent* 40 lbs Glauber's salt**	2 lbs Nonionic detergent* 2 lbs Glauber's salt**
Bowl #2 1625 gals 145°F	8 lbs Nonionic detergent 16 lbs Glauber's salt	4 lbs Nonionic detergent 4 lbs Glauber's salt
Bowl #3 1300 gals 135°F	2 lbs Nonionic detergent 4 lbs Glauber's salt	Only as needed as indicated by a light suds.
Bowl #4 120°F	Rinse	

Costs were approximately the same as for the regular soap and soda scour (16 cents per 100 pounds grease wool).

* Kyro EO (Registered trademark)
** Anhydrous

TABLE II

Procedure at Plant No. 2

5 bowl—48" train—Average 1800 lbs grease wool per hour feed rate

Bowl	*Initial Charge*	*Additions Each 30 Minutes*
Bowl #1 3000 gals 140°F	25 lbs Nononic detergent* 50 lbs Glauber's salt** Drop bowl to screen about every 6 to 8 hours and make a double addition	2½-3 lbs Nonionic detergent* 2½-3 lbs Glauber's salt**
Bowl #2 1500 gals 140°F	6 lbs Nonionic detergent 12 lbs Glauber's salt Drop bowl to screen about every 8 to 10 hours and make a double addition.	½-1 lb Nonionic detergent ½-1 lb Glauber's salt
Bowl #3 1500 gals 130°F	Rinse	
Bowl #4 1500 gals 120°F	Rinse	
Bowl #5 1500 gals 110°F	Bleach	

This formula was set up to provide for maximum utilization of Bowl #1 for scouring.
Extractions for residual grease content indicated very uniform scouring as they were consistently in he range of 0.3—0.6%.
Costs compared favorably with those for soap (tall oil) and soda scouring (17 cents per 100 lbs grease wool).

* Kyro EO (Registered trademark)
** Anhydrous

TABLE III

Procedure at Plant No. 3

5 bowl—48" train—1500 lbs grease wool per hour feed rate

Bowl	*Initial Charge*	*Additions Per Hour*
Bowl #1*** 975+900 = 1875 gals 145°F	15 lbs Nonionic detergent* 30 lbs Glauber's salt**	4-5 lbs Nonionic detergent* 4-5 lbs Glauber's salt** Additions are made until the grease recovery system starts and are then stopped.
Bowl #2 975 gals 145°F	8 lbs Nonionic detergent 16 lbs Glauber's salt	4-5 lbs Nonionic detergent 4-5 lbs Glauber's salt
Bowl #3 1796 gals 145°F	8 lbs Nonionic detergent 16 lbs Glauber's salt	1-2 lbs Nonionic detergent 1-2 lbs Glauber's salt
Bowl #4 1397 gals 130°F	2 lbs Nonionic detergent No Glauber's salt	As needed to maintain a light suds.
Bowl #5 1397 gals 120°F	Rinse	

(Since Bowls #1 and #2 are so short, they were operated as if they were a single bowl.)

* Kyro EO (Registered trademark)
** Anhydrous
*** Grease recovery storage tanks

The amounts of peroxide and sulfuric acid needed in bleaching were substantially reduced.

The color and handle of the stock were noticeably better and customer reaction was very favorable.

Plant No. 3—This plant operated a five bowl train equipped with a centrifugal grease recovery system. The ratio of water to wool in the first two bowls was very low in order to obtain maximum grease recovery. Both woolen and worsted combing wools were scoured in this equipment.

As the scouring progressed, it was found possible to cut the additions by 30% on the second day and by 50% from the third day on through the week. Operation was carried on for a full week without complete dropping of the bowls. (See Table III).

Residual grease contents averaged 0.4% throughout a full week's run (200,000 pounds grease wool 62°-64°).

The improvement in color and loftiness of the stock was immediately noticeable as compared to soap and soda ash scouring. It was possible to reduce the temperature in the dryer very substantially; in fact, the heat was cut off entirely in the second section of the dryer.

There was a 1% decrease in noilage in combing which is very significant.

Grease recovery was increased by 20%; however, it was of a darker color.

Costs of materials were less than with soap and soda ash (13 cents versus 16 cents per 100 pounds of grease wool).

Plant No. 4—This plant is engaged in commission scouring and combing and handles all types of combing wools. They operate both four and five bowl trains equipped with centrifugal grease recovery systems and also do some bleaching.

This plant was already neutral scouring some of their wools but at higher temperatures (160-165°F) and without Glauber's salt. The rest of the wool was being scoured with soap and soda ash. (See Table IV).

The improvement in color, lower drying temperatures, etc were also obtained here as compared to the soap and soda ash scouring. A higher grease recovery and better colored grease were also obtained as compared to neutral scouring at 165°F without Glauber's salt.

Wools scoured with the Nonionic Detergent and Glauber's salt ran noticeably better in carding and combing than the same wools scoured neutral at higher temperatures without Glauber's salt.

TABLE IV

Procedure for Plant No. 4

5 bowl—48" train—1700 lbs grease wool per hour feed rate

Bowl	*Initial Charge*	*Additions Per Hour*
Bowl #1 2700 gals 90°F	Suint (water only)	—
Bowl #2 2200 gals 145°F	18 lbs Nonionic detergent* 36 lbs Glauber's salt**	6 lbs Nonionic detergent* 12 lbs Glauber's salt** Additions are made until the grease recovery system starts and are then stopped.
Bowl #3 1700 gals 145°F	8 lbs Nonionic detergent 16 lbs Glauber's salt	4–6 lbs Nonionic detergent 8–12 lbs Glauber's salt
Bowl #4 1500 gals 135°F	1 lb Nonionic detergent No Glauber's salt	As needed to maintain a light suds.
Bowl #5 120°F	Rinse	

* Kyro EO (Registered trademark)
** Anhydrous

CONCLUSIONS

Since equipment and wools vary so much from plant to plant, it is not possible to give a specific procedure to fit all conditions. For best results, each plant should have a "tailor-made" procedure for its specific conditions and equipment although there are certain minimum starting concentrations of detergent and builder which will apply in all cases. The temperatures used will depend on the individual plant and its ability to maintain a uniform temperature.

The laboratory work showed that starting concentrations of 0.1% Nonionic Detergent* and 0.2% anhydrous Glauber's salt solutions were necessary for adequate scouring in the first scouring bowl (about 8 pounds of detergent and 16 pounds of Glauber's salt per 1,000 gallons of solution). This starting concentration when used in the plant tests gave good results. Scouring Bowl #2 can usually be operated at one half the concentration of scouring Bowl #1 (ie, 4 pounds of detergent and 8 pounds of Glauber's salt per 1,000 gallons).

Additions to these bowls had to be based on the feed rate as well as the types of wool. When scouring was done *without* a suint bowl, detergent and Glauber's salt were added in equal parts. When scouring was done with a suint bowl, it was found advisable to make additions in the ratio of 1 part detergent to 2 parts of Glauber's salt.

The usage of detergent and salt varies with the types of wool scoured as well as the grease content. The usage is also affected by the scouring method employed. Obviously, systems utilizing continuous grease recovery and returning the recovered detergent, etc to the bowls are more economical to operate than those without grease recovery systems. On the average, about 0.5% Nonionic Detergent* and from 0.6% to 1.0% of Glauber's salt on the weight of the grease wool scoured give satisfactory results.

The higher the temperature, the more efficient the scouring; consequently, less scouring materials are needed.

When a grease recovery system is used, it is possible to run a full week without dumping the bowls especially where the counterflow principle is in operation.

Trains not equipped with grease recovery systems can also be operated for a full week by dropping the scouring bowls to the screen only at regular intervals and making up with fresh water.

Residual grease contents tended to run slightly lower than considered ideal for the conventional soap and soda ash type of scour. However, the fiber showed none of the customary characteristics associated with overscouring. The system has been operated on a basis of 0.3% or less residual grease without any of the usual symptoms of low grease content, such as dry, harsh or wiry handle.

This system is particularly adaptable to the scouring of pulled wools in that there is little danger of lime soap formation. This minimizes the possibility of gumming up the card clothing and obtaining streaky or uneven piece dyeing. Undesirable odors which sometimes develop on storage in piece goods containing residual lime soaps are largely eliminated.

As in any new process, there may be certain disadvantages such as the higher temperatures required. Some plants may not have boiler capacity sufficient to provide the heat required. Recovered grease is generally darker in color.

* Kyro EO (Registered trademark)

* Kyro EO (Registered trademark)

Observations indicate that paint contaminated wools may be harder to handle in the neutral system than by the soap and soda ash method, primarily because of the higher temperatures used which tend to soften and spread the paint more.

ADVANTAGES OF NEUTRAL SCOURING

The results of extensive field tests show that the neutral raw wool scouring system has the following advantages over conventional soap and soda ash scouring:

1) Easily handles all kinds of wool from the coarsest to the finest.
2) Exceptionally good on wools stored for a long time.
3) Wool has noticeably whiter and better color.
4) Increased production (5%-15%).
5) Fiber has a better feel.
6) Blueing more uniform.
7) Less peroxide required to bleach.
8) Less acid required in the bleach.
9) Better pH control of fiber (pH ranges from 6-8).
10) Produces a loftier wool.
11) Much faster drying.
12) Greater staple length in worsted wools.
13) Lower noilage in combing (as much as 1.0% less).
14) Higher top yields.
15) Higher grease recovery (up to 20% more).
16) Practically impossible to overscour. (This is from a fiber handle standpoint, not grease content.)
17) Costs compare favorably with conventional soap and soda ash scouring (12 cents to 20 cents). In many cases, costs are less.
18) Handles pulled wools very well without special precautions.
19) Much less materials to be handled.

Industry reaction indicates that the advantages to be gained in neutral scouring far outweigh the disadvantages and it appears that "neutral" scouring is here to stay and represents a milestone in the history of wool processing.

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OCTOBER 22, 1956

Your Candidates———

GEORGE O LINBERG
Candidate for election as president

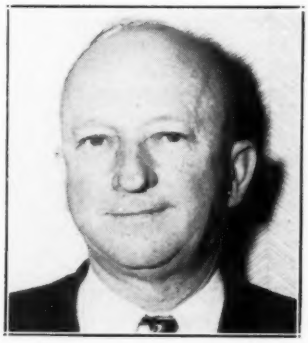
WALTER M SCOTT
Candidate for election as president

ERNEST R KASWELL
Candidate for reelection as vice president, New England Region

FREDERICK V TRAUT
Candidate for reelection as vice president, Central Atlantic Region

WELDON G HELMUS
Candidate for election as vice president, Central Atlantic Region

C RUSSELL GILL
Candidate for election as vice president, Southern Region



H GILLESPIE SMITH
Candidate for election as vice president, Southern Region

ELLIOTT MORRILL
Candidate for election as vice president, Western Region

GEORGE O LINBERG

Candidate for election as president

GEORGE O LINBERG, a graduate of Pratt Institute, is vice president and New England sales manager for Synthron, Inc, Ashton, RI.

He has been a dyer, finisher, and demonstrator of both natural and synthetic fibers and blends. He has written and had published several articles on textile processing and dyeing, and is the originator (patents) and developer (with coworkers) of a method for the continuous dyeing of wool and woolen piece goods with indigo.

Mr Linberg began his career in the laboratory of Kalle & Co. He was chief chemist for standardization for Newport Chemical Works and entered the sales field of dyestuffs, fine chemicals and aromatics, continuing with Du Pont for another 15 years. In 1946, Mr Linberg became sales manager of the Textile Department of Monsanto Chemical Co, and followed as vice president and sales manager of Belle Chemical Co until joining Synthron in 1952.

AATCC Activities—Mr Linberg has held the offices of treasurer and chairman of the Northern New England Section, national councilor, national vice president for two terms, chairman of the 1946 and 1952 Conventions, and general program chairman of the recently concluded Perkin Centennial. He serves or has served on several technical committees. Presently, he is chairman of the National Convention Committee and a member of the President's Advisory Committee.

WALTER M SCOTT

Candidate for election as president

WALTER M SCOTT, who holds a Ph B from Yale Scientific School and a Ph D from Yale University, is assistant director, Utilization Research, Agricultural Research Service, U S Dept of Agriculture, Washington, DC.

He is the author of numerous scientific publications, has been granted several patents, and has spoken before many groups.

Dr Scott began his extensive career as chief chemist at Cheney Brothers. Subsequently he held the following positions: technical advisor to the Sales Dept, National Aniline & Chemical Co; service director, Munsell Color Co; service director, Gustavus J Esselen, Inc; chief, Cotton Chemical Finishing Div, Southern Regional Research Laboratory, U S Dept of Agriculture; colonel, U S Army Chemical Warfare Service; director, SRRL; assistant chief, Bureau of Agricultural and Industrial Chemistry.

AATCC Activities—A member of General Organization Committee for Inaugural Meeting, Dr Scott served as councilor-at-large for first 10 years of AATCC, subsequently councilor for the Northern New England, Southeastern and Washington Sections. He is currently serving as national vice president, representing the Southern Region, and chairman of the Technical Program Committee. He also served as chairman of the Technical Program Committee in 1954.

Dr Scott served as a member of the General Research Committee from its inception in 1921, and also served as a member of ECR. In addition, he has served as chairman, Committee on Colorfastness of Silk Textiles, Committee on Analytical Methods for a Textile Laboratory, and Committee on Color. For many years he has served as an AATCC delegate to the Inter-Society Color Council.

As secretary *pro tem*, Dr Scott presided at the organization meeting of the Washington Section, for whom he presented a petition of formation to the Council. He also has been a member of the New York, Northern New England, Southeastern, and Philadelphia Sections.

ERNEST R KASWELL

Candidate for reelection as vice president, New England Region

ERNEST R KASWELL, president and associate director of Fabric Research Laboratories, Inc, Dedham, Mass, holds a master's degree from Massachusetts Institute of Technology. A former staff member of MIT's Textile Division, he spent one year as a research chemist for American Cyanamid Co prior to his becoming one of the founders of FRL in 1942.

Mr Kaswell has authored many publications in textile physics and chemistry, including a reference book, "Textile Fibers, Yarns and Fabrics".

AATCC Activities—Mr Kaswell, incumbent vice president representing the New England Region, is a past chairman of the Northern New England Section and chairman of the TCR's Committee on Wrinkle Resistance. He is general chairman of the 1957 Convention, which will be held in Boston.

WELDON G HELMUS

Candidate for election as vice president, Central Atlantic Region

WELDON G HELMUS is vice president and general manager and a member of the board of Fair Lawn Finishing Co, Fair Lawn, NJ.

Prior to his joining Fair Lawn in 1940, Mr Helmus was with the Textile Dyeing and Printing Company of America as assistant plant superintendent.

AATCC Activities—Mr Helmus has held various offices in AATCC, among them councilor. He is a past chairman of the New York Section, and headed the Section's Intersectional Contest Committee in 1948.

FREDERICK V TRAUT

Candidate for reelection as vice president, Central Atlantic Region

FREDERICK V TRAUT, who attended Philadelphia Textile Institute, is superintendent of processing, Globe Dye Works Co, Philadelphia, Pa.

Mr Traut has been with Globe since 1934. Prior to that time he has worked as a laboratory assistant for United States Testing Co, Philadelphia.

AATCC Activities — On the sectional level, Mr Traut has served the Philadelphia Section as chairman, vice chairman, treasurer, chairman of the Dining Committee, and as a member of its Sectional Committee.

On the national level, Mr Traut is serving as vice president, Central Atlantic Region, and as a member of the Publications, National Convention, President's Advisory, and Organization Committees. He served as general chairman of the 1955 Convention, and also as a councilor for three years.

C RUSSELL GILL

Candidate for election as vice president, Southern Region

C RUSSELL GILL, president of Southern Sizing Co, East Point, Ga, received a BS in chemistry from Worcester Polytechnic Institute.

He began his career as a chemist and bleachery overseer with Holliston Mills, later going with Stein, Hall & Co, Inc as a chemist, technical service representative and salesman. He joined Southern Sizing in 1937, serving as vice president and sales manager until 1942. After service in the U S Army for three years, he was separated as captain, Chemical Warfare Service, returning to Southern Sizing Co.

AATCC Activities—Vice chairman and chairman, Southeastern Section; councilor; general chairman, 1954 Convention; member of National Convention Committee.

(concluded on page P796)

Perkin Centennial
International Day———

CURRENT DEVELOPMENTS IN COLORFASTNESS TESTING IN THE UNITED KINGDOM*

P W CUNLIFFE

Chairman, Fastness Tests Coordinating Committee, Society of Dyers and Colourists; Research manager, British Cotton and Wool Dyers Association Ltd, Manchester, England

GENERAL

THE Society of Dyers and Colourists is composed largely of scientists and technologists from the dye manufacturers and dye users and consequently finds itself in a fortunate and authoritative position with regard to matters relating to color. Among these the subject of color fastness tests has been prominent in the Society since 1928, and it has been a source of much satisfaction to all that the efforts which it has made, and those of of the other national bodies with which it has had such close and friendly relations, should have culminated in the agreed international ISO tests.

The Society published the ISO tests, together with those still in the tentative stage and a few others, in its journal in June, 1955 (*1*). Moreover, it immediately advised the British Standards Institution to accept the tests, and this body lost no time in setting them up in its own format and by February 1956 had issued them as British Standards (*2*). This double authority and the knowledge of past acceptance ensures the general usage of the tests in Great Britain, and through this country certain others overseas.

During recent years the Society has paid particular attention to certain of the tests which it feels are not yet satisfactorily defined, due to inadequate knowledge of the principles or factors involved. In particular the members have made a special study of the problems of fading and of perspiration and it is proposed to give an outline of these investigations.

Further it is proposed to give a short survey of the development and uses of grey scales. This is felt to be justified, although not perhaps falling strictly within the title of these papers, for two reasons; firstly, some countries have not yet brought them into general use, due it may be, to the somewhat unfamiliar principle involved; secondly, SDC has played a prominent part in this work.

LIGHT FASTNESS

In 1949, the Society of Dyers and Colourists held a symposium on photochemistry (*3*) at which many of the papers dealt with the subject of the measurement of light fastness. The existing British method, which had been published in 1934 (*4*), came in for much criticism and many valuable suggestions regarding its improvement were made. The Fastness Tests Co-ordinating Committee consequently appointed a subcommittee (the Light Fastness Subcommittee) to study the question with a view to improving the test.

DAYLIGHT TEST———The subcommittee first devoted its attention to the daylight test. This is regarded in Europe as being of greater importance than a fading lamp test, mainly because a suitable artificial light source is not yet freely available. At the same time, the continental fastness committees were also working on the improvement of their own method, which fundamentally was identical with our own. International collaboration, which has been such a welcome feature of the post-war years, has now led to an international daylight test, the essential features of which are: firstly, that specimens are exposed with eight blue wool standards to daylight behind glass for 24 hours per day at any time of the year, and secondly, that specimens are assessed mainly on a full fade; the "first break" has been regarded since the 1930's as unreliable, but should a "first break" occur at an early stage of exposure in an otherwise fast specimen, the fact is recorded.

The international daylight test is felt to be satisfactory except that standard 6 is not quite fast enough; many alternatives have been examined over the past few years, but so far no better standard has been found.

Although this test was developed originally for colored textiles, it has been officially adopted by many other industries in the UK, notably, plastics, anodized aluminum, and leather In the very important pigment industry the Light Fastness Committee of the Oil and Colour Chemists Association, after studying the problem, considered that the industry should investigate its use and this is now being done. The Light Fastness Committee of the British Paper and Board Makers Association are also actively studying the possibility of adopting the textile method.

Today, more and more government and business specifications include a light fastness clause which refers to the international daylight test, and one or two British Standard Specifications—furniture, for example—also refer to this test. Some of the earlier specifications required that the material should withstand a stated number of hours in a fading lamp (a method which will be familiar to Americans), but this has now been eliminated because of the well-known defects of this method.

An extensive investigation into the reproducibility and reliability of the daylight test has just been completed and the following conclusions have been reached:

a) In the majority of cases, the same result should be obtained no matter where or when the exposure is made.
b) Different results will be obtained in different parts of the world with those materials with which the rate of fading is dependent on their moisture con-

* Presented during "International Day," September 10, 1956 during the Perkin Centennial at the Waldorf-Astoria Hotel, New York, N.Y.

tent during exposure, for example, many azoic combinations applied to cellulosic fibers. There are many dyed and printed fabrics which fade much more quickly under the predominantly cloudy skies of northern Europe than in sunnier lands such as the USA and in such a case a false idea of their light fastness will be obtained if they are exposed only when the sun is shining or in a lamp designed to imitate such sunny conditions.

FADING LAMPS —— The committee has made an intensive study into the reasons for the incorrect results sometimes given by fading lamps (5). This has involved us in photochemistry, since very little was known about the spectral regions of sunlight which cause fading; without this knowledge it is impossible to assess the part played by the intense UV radiation in the enclosed carbon arc. The work has shown (6) that the wave lengths which cause fading are determined by the color of the specimen and by its light fastness; fugitive dyes are faded mainly by visible light while fast dyes are faded mainly by violet and ultraviolet light. The excess UV emitted by the enclosed carbon arc was found to be of much less importance as a cause of anomalies than had been expected, but it was conclusively shown that any attempt to equate one hour's lamp exposure with so many hours sunshine must be misleading.

The chief cause of anomalies was found to be the effective humidity during exposure, the Atlas Fade-Ometer being somewhat drier than British daylight and much drier than some screened British lamps. A recommendation has just been issued by the Society specifying that lamps in the UK should operate at the same effective humidity as that which occurs during an average exposure to British daylight.

WEATHERING TEST —— The committee has also studied the question of a weathering test and has concluded (7) that it is practicable to use a Weatherometer based on the carbon arc, at least until an artificial source closer to daylight is readily available. Two considerations have been prominent in our minds; firstly, that there are no suitable weathering standards which would allow a natural weathering test to be conducted and to establish such a series would take many years, and secondly, that natural conditions vary so widely. It is felt that a reliable test using the dry PSO Daylight Standards in a Weatherometer can be adopted immediately, and in fact such a method is in daily use by several important firms in the UK. The experience to date is that all fabrics which have been given a high rating in the Weatherometer have proved satisfactory in practice, and photochemical considerations show that the method is essentially sound.

FASTNESS TO PERSPIRATION

In England the earliest detailed investigation into perspiration fastness was reported fully in the first report of the Fastness Committee of the Society of Dyers and Colourists in 1934 (4). This early work led to the discovery that human perspiration, when freshly shed, is in the large majority of cases acid in reaction (pH values from 5.1 to 7.35 were recorded), but becomes alkaline on incubation at 37°C, the change being brought about by bacterial action, leading to the formation of ammonia. It was also found that the perspiration from males and females gave similar pH values.

At a considerably later date the Society of Dyers and Colourists, through its Fastness Tests Co-ordinating Committee, appointed a subcommittee to reopen the question of testing for fastness to perspiration and some of the results of this investigation have been published in the journal of the Society in October 1952 (8), and February 1954 (9).

It has long been known that the shades of blue acid anthraquinone dyes of the type of Solway Blue BS are very considerably affected by perspiration, and that this effect could be imitated very closely by a treatment with common salt solution of a concentration considerably higher than in perspiration. It was found that a more serious effect was produced with shades on cellulosic materials dyed with copper-complex direct dyes or direct dyes after treated with copper-containing agents. The first observation of this kind was made with Solar Red Brown 2RL (S), which is changed by perspiration from red to orange, the change being due to removal of copper from the dye complex. This is easily proved by coppering the orange shade when the original hue is restored. As would be expected the change in shade is accompanied by a lowering of the light fastness.

This observation pointed to the fact that there is some product present in human perspiration which acts strongly as a sequestering agent for copper, and a study of the reported constituents of perspiration led to the belief that this might be found in the aminoacid content. Support for this view was obtained by using aminoacetic acid, which was found to behave with Solar Red Brown 2RL in a similar manner to perspiration.

In 1946, Heir, Cornbleet, and Bergeim (10) published details of the aminoacids in human perspiration giving mean values for the content of ten compounds of this type which they found to be present. The subcommittee examined the effect of all these compounds and found that each of them gave an effect similar to that given by human perspiration but that histidine was easily the most reactive.

Tests were made on a representative range of shades produced with copper-complex direct dyes, aftercoppered direct dyes, and direct dyes after treated with resinous compounds in conjunction with copper. In every case, to a greater or less extent, the effect of human perspiration was removal of copper and a lowering of the light fastness. In addition an examination was made of a few dyeings on wool, eg, Erio Fast Purple A and Neolan Blue 2G containing copper and chromium respectively, which were found to be practically unaffected by human perspiration. Treatment of all these dyeings with solutions containing histidine gave results which very closely imitated the effect of natural perspiration.

Consideration was given to other products which have a sequestering action, such as Calgon T, Trilon A, Trilon B, thiourea, thioglycollic acid, etc, but although many of these were reactive with copper-containing dyeings of direct colors, histidine gave, in general, the closest imitation of the effect of perspiration.

An investigation was made of the pH values of wool cloths which had been subjected to perspiration as, notwithstanding the production of ammonia by bacterial action, it seemed possible, owing to the volatility of ammonia, that an acid dyed cloth might not be neutralized even after prolonged treatment. The results of the investigation very largely confirmed this possibility. Tests were then made on a cloth giving a water extract of pH 9.5, patterns of this cloth being worn next to the skin, under an arm, by 15 persons, of both sexes. Water extracts of the patterns after the test gave an average pH of 7.1, the highest recorded being 8.8 and the lowest 4.1, although the latter

figure is so exceptional that it must be accepted with reserve.

The results so far obtained confirm the 1934 report of the Fastness Committee of the Society of Dyers and Colourists that human perspiration is, in at least the majority of cases, acid in reaction, but do not preclude the possibility that in a few cases it may be alkaline. Only a protracted series of tests could settle the point. Furthermore a number of dyed wool cloths which have not been piece dyed can easily give a pH materially higher than 7 as is also the case with garments which are washed. With the present state of knowledge, it seems desirable that two artificial perspiration tests should be used, one acid and the other alkaline in reaction.

An important constituent of perspiration is common salt, present in a concentration of approximately 3 parts per 1000, but salt solution of this strength will not bring about the change in shade which is caused by perspiration with dyes of the Solway Blue B type. To imitate this, about four times the strength is required. The subcommittee is of the opinion that the use of this larger amount of salt in an alkaline testing solution is inadvisable as it could lead to an uptake of alkali by wool which is not experienced with natural perspiration.

As a result of its investigations the subcommittee put forward the tests for perspiration fastness which are now under consideration by ISO. It was found necessary to use a considerably higher concentration of histidine than is actually present in perspiration to obtain the desired result but this is understandable as the effect of perspiration is cumulative. So far the tests have been satisfactory.

GREY SCALES

In the carrying out of a fastness test, the task is by no means completed until an assessment has been made of the changes which have taken place. Unless stringent conditions are laid down for this purpose, it is often possible for different conclusions to be drawn from the same set of test patterns. The simplest method that can be employed is a verbal description of the change which has taken place, but this is so subjective that much effort has been expended over the years and by many organizations into devising a more objective and reliable method. The main types of approach have been as follows:

a) The tests themselves were multiplied in number and were arranged to increase in severity, so that it was possible to use them on a pass-fail basis.
b) Standard dyeings of predetermined fastness were prepared and the appropriate ones subjected to the test along with the specimen to be tested. This method was used for many years but was finally abandoned when the number of standards required became excessive.
c) Fixed standards have been suggested by different countries using a range of colored patterns to form a permanent illustration of all the possible changes. Again the number of patterns required is excessive.
d) The latest approach is a very simple one and involves the setting up of a range of contrasts, which are made to an agreed theoretical specification and which are reasonably permanent in themselves.

The development of the present ISO Grey Scales, two of which are prescribed, the one for assessing the change in the pattern and the other for assessing the staining on the adjacent white material, forms an interesting chapter in the history of fastness tests. We feel there is some justification for our including this subject here since the Society of Dyers and Colourists has played a prominent part in the development of the concept.

Several attempts had previously been made to set up a scale of grey patterns or printed chips, but as the history of these has been recorded in the Journal of the Society of Dyers and Colourists (*11*) I will pass directly to the present contrast type of grey scale.

So far as we in England are aware, the first use of a scale of contrasts was that of the SDC Wool Dyes Committee, which in 1947 prepared a scale in dyed wool for assessing the degree of migration of wool dyes. This comprised five pairs of grey dyeings, each pair increasing in contrast from 5 on the scale representing no change to 1 representing a considerable change.

Following discussions with the continental fastness bodies at Basel in 1951, at which the advantages of assessment by contrast was emphasized by the SDC, we prepared for the ISO meeting at Bournemouth in the same year a grey scale which had by then been modified so that the five pairs of grey increased in contrast in a geometric manner; this spacing gives the smallest differences at the 5.4 end and the greatest at the 2.1 end, thus agreeing with the commercial importance of the changes represented.

The ISO Conference accepted the principle of a geometric grey scale and that it should be defined in terms of color measurement, by which means reproducibility was assured. Negotiations followed between the principal national fastness committees concerning the most desirable spacing of the scale, and at the ISO meeting in November 1952 in New York agreement was reached that this should be 0, 1.5, 3, 6, 12 NBS units.

The history of the Grey Scale for Assessing Staining is somewhat similar to that outlined above. After various stages of development it was ultimately agreed that the contrasts of this scale should be 0, 4, 8, 16, 32 NBS units.

The two scales are produced in quantity a) in England on paper by means of pigment coated cards and b) in Germany by dyeings on cotton.

Speaking for Great Britain, I think it can be said that the two ISO grey scales are well established and are in regular use in testing laboratories both of the users and of the dye manufacturers; indeed, the latest (1954) edition of the publication on "The Fastness Assessment of Textile Dyestuffs" by ICI actually contains one each of the two scales for the use of the readers.

In conclusion, it may perhaps be mentioned that the acceptance of the concept of a grey scale rests on sound statistical evidence, not only for its use in assessing changes in depth of shade but also for assessing the overall effect, which may include hue and brightness changes.

This, of course, is the specified method of use, though provision is made for recording the qualitative nature of the change if hue and brightness changes are involved.

ACKNOWLEDGMENT

Thanks are due to the members of the Fastness Tests Coordinating Committee, who made contributions to this paper.

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CURRENT DEVELOPMENTS IN COLORFASTNESS TESTING IN FRANCE*

J P NIEDERHAUSER

Delegate of the French Commission on the Fastness of Colors and Prints; Compagnie Francaise des Malieres Colorantes, Paris, France

WHEN I was asked to speak to you today about the evolution in France of the problems of fastness, I could not help but remark to myself. "Is it not paradoxical to devote the initial meeting of the Perkin Centennial to the method devised to degrade dyed and printed shades, rather than to the extolling of the value of dyestuffs and of color?"

I do not believe it necessary however to dwell at length on this anomaly. You all know that a dyed textile can only be sold if it exhibits a minimum resistance to the various deterioration agents, which it may come in contact with while in use.

The importance of this problem did not begin with the discovery of the first synthetic dyestuff since, as you have just been told, one already finds fastness specifications in the Ordinance to the Dyers (Code of Dyers) promulgated by the French Commerce Minister Colbert in 1669. This document may be considered as the ancestor of all our present fastness codes.

From this time on, the manufacturing of high quality dyeings and prints, has always been the prime concern of our Textile Industry.

It remains so nowadays. From the end of the 2nd World War the astonishing development of the means of transportation, and as a consequence the shortening of distances, have placed French Textile Industry in close and speedy contacts with all the markets of the world.

Specialized laboratories found it necessary to undertake a searching study of the conditions of examination of the fastness of dyeings and prints, aimed at simplifying and uniformizing trial methods, and at maintaining the high quality of world-famous French textile articles.

In 1947 a Fastness Tests Committee was created at the French Textile Institute. From its inception, this board recognized the necessity of studying the fastness standards problem not at the national level only, but at the international level.

At that time there were already a great number of fastness codes mainly in Germany, in England and in the USA.

It appeared useless to the French Committee to devise a new strictly French Code, and to set up a new series of trial methods solely applicable at the national level.

So, as early as 1948, contacts were established with the Swiss Industry, which had just set up also a Fastness Committee to study the same problem.

The first joint meetings of the Committees of these two countries took place in 1949 and 1950, and the German Fastness Committee joined the French and Swiss technicians to jointly undertake the study of the problem.

The French Textile Industry committees vigorously lent their support to this joint work with Foreign Committees and have approved without any reservation the taking over by ISO of the study of this problem at the world level.

The Fastness Tests Committee of the French Textile Institute brings together representatives and technicians of all branches of the industry concerned with the problem of fastness: dyers and printers, technicians and dyestuff manufacturers, representatives of textile study and research laboratories, officers of the Quartermaster Corps, representatives of great public administrations, etc.

Thus the Fastness Code provisionally adopted in 1951 and known as "Code ECE" (code recognized by several European countries) enjoyed a great success and was immediately utilized by all laboratories. Better still the French Association of Normalization has had most of the test methods of this Code adopted as National Methods.

The work undertaken by ISO is followed with great interest and the French Commission hopes that it will very soon result in international recommendations recognized throughout the world.

The latter will, by the way, be made into official specifications of the French Government just as soon as possible.

Among the problems which have especially interested the French Board is that of light fastness.

While during the summer we usually enjoy throughout our country a period of sunshine favorable to light fastness tests, it is not so in winter, and numerous laboratories of Central and Northern France regularly employ arc lamps, more especially the Fade-Ometer, to obtain quick determinations of fastness.

While this kind of apparatus gives excellent results for some types of speedy industrial controls and permits the checking, without possibility of error, of truly light-poor dyeings, they may on the other hand lead to false conclusions when they are employed to give an exact fastness rating corresponding to daylight exposure.

To speed matters up during the winter months, the French Fastness Committee has installed in Southern France at Aigues-Mortes, which enjoys a very sunny weather throughout the year, a sunlight exposure station where all French manufacturers may send their dyeings so that they may be submitted to the best sunlight conditions whatever the season. This system which has already been in operation almost a year, gives full satisfaction, and this exposure station created initially for textiles, will soon serve the paper, leather and other industries.

Already fashion stores, ready-made clothiers, and car manufacturers send their dyed fabrics to Aigues-Mortes, and the number of samples exposed to date exceeds already what was anticipated when this exposure station was set up.

This short summary evidences the interest which textile quarters show for the problem of fastness. It is proof that the high quality of French dyeings and prints is of prime importance to them.

* Presented during "International Day", September 10, 1956, during the Perkin Centennial at the Waldorf-Astoria Hotel, New York, NY.

CURRENT DEVELOPMENTS IN COLORFASTNESS TESTING IN SWITZERLAND*

HENRY RIS
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A SMALL country in the heart of Europe without natural resources, Switzerland is dependent for its existence on the quality of its industrial production and its export trade. For us in Switzerland it is, therefore, a vital necessity to understand and speak the languages of our principal export markets. Besides these various spoken idioms, however, the terminology of the industrial sciences is also of the greatest importance to us. Hence it is not surprising that we should participate as a matter of course in every effort to achieve international understanding and unity.

When we single out from the vast field of textile technology the small sector "color fastness" and call to mind the period between 1930 and 1940, we are struck by the bewildering variety of test methods then in use. Of course, at that time authoritative bodies, such as the Deutsche Echtheitskommission (DEK), the Society of Dyers and Colourists (SDC) and the American Association of Textile Chemists and Colorists (AATCC) were busily engaged in formulating test methods, as were the dye manufacturers, but unfortunately this work proceeded without close collaboration and its objectives were confined to the needs of the countries concerned.

On the Continent of Europe the test methods of the DEK gained a certain degree of acceptance. However, the proliferation of test methods according to fibers and above all the great number of dyed standards made this an extremely involved and confusing system for evaluating color fastness. The basic evil was that the fastness ratings obtained on different fibers were not comparable.

I will now attempt to delineate briefly the five essential points of the conception which has contributed very considerably to the international standardization of fastness testing, an event which we here in New York have the pleasure of witnessing.

The first major step was made in 1935 in connection with the assessment of light fastness. In that year the German and Swiss dye manufacturers agreed to introduce the eight-stage Blue Scale on wool, which was thus recognized as a standard applicable to all dyeings and all textile materials.

This Blue Scale is composed in a geometric progression in such a way that, roughly speaking, each step represents in terms of fastness twice the length of exposure or—more exactly—twice the amount of incident light of the preceding one. Owing to the steep mode of progression the rate of increment at higher levels of light fastness from stage 5 upwards is very great, and in consequence half a unit, for example 6-7, acquires considerable significance.

A second innovation dating from the same time was the assessment of color fastness to light in shades of the same tinctorial depth for all dyestuffs and all fibers. For this purpose a series of standard or "auxiliary type" depths was determined. This was an excellent idea which made it possible for the first time to compare the light fastness ratings of all dyestuffs without exception. It found rapid recognition and gave dye makers and users throughout the world a common frame of reference for color fastness.

No concrete progress towards standardization could be made during World War II and the years immediately before and after it.

During the war years, however, the work of simplification was progressing quietly in Switzerland, and in 1947 it bore fruit in the establishment of the Swiss Fastness Committee, composed of groups interested in this matter, as textile industries, dyestuff manufacturers and the "Swiss Federal laboratory for testing materials and research." In these years all the known test methods for fastness to water, sea water, washing, milling, alkali, acid, etc, were compared in extensive series of tests. To our great satisfaction the comparative assessments revealed that the relatively slight variations which occurred were not so much material differences as differences in degree. The formulation of test procedures, applicable as far as possible to all fibers, thus appeared to be a realizable aim, given an open-minded approach and a willingness for compromise. An exception was formed by processes of a special nature, such as carbonizing, mercerizing, kier boiling, etc.

The third decisive advance was the development of synoptic scales for measuring the "change of shade" and "staining." The main landmarks leading to this result were the "Color Transference Chart" of the AATCC, the almost simultaneous appearance of a series of colored scales proposed by Imperial Chemical Industries (ICI) in England and E W Thommen in Switzerland, and the Grey Scale for the assessment of staining devised by the SDC.

This fruitful basic conception, after years of intensive coordinated study by the European Fastness Committee (ECE) and the SDC, has led to the two present-day Grey Scales which permit the change of shade and the degree of staining to be measured and assessed.

Like the Blue Scale, these Grey Scales are assembled as a geometric series, so that the standard of fastness becomes progressively severer as one ascends the scale. The contrast between unchanged and changed or stained and white is most pronounced at stage 1. With the Grey Scales it became possible for the first time to define fastness ratings by the degree of contrast and to measure fastness with a standard instrument.

However, these measurements can be carried out correctly only when the tests are conducted with flat materials which produce over the entire surface an even change of shade and a uniform depth of stain on the attached white. This effect was achieved by the introduction of the sandwich type of specimen. In this way the fifth great advance was realized.

The basic ideas I have just described have been favorably received and have been developed and brought

* Presented by Fritz Buxtorf, technical representative, Sandoz Ltd, Basle, Switzerland, during "International Day", September 10, 1956 during the Perkin Centennial at the Waldorf-Astoria Hotel, New York, NY.

to the present level in an admirable spirit of collaboration.

The stages of this development are briefly as follows:

In 1949, on the initiative of Switzerland, the first combined meeting of the French and Swiss Fastness Committees was held in Paris.

In 1950 the DEK joined this association.

In 1951, at the first meeting of the European Continental Fastness Committee (ECE) in Basle, the original text of the first standard test methods for color fastness was presented and approved.

In the same year the ISO conference in Bournemouth gave member countries the first opportunity for consultations on a international level; they were conducted in a spirit of friendly cooperation and produced very satisfying results.

In 1952 the second ISO meeting followed in New York, and in 1954 the third in Scarborough.

In 1956 we are again in New York, where with feelings of satisfaction at what has been achieved and gratitude for the fine team spirit that has made this achievement possible, we have come together to give our approval to the first 24 test methods embodied in the official ISO Recommendations.

We recall with pleasure the part which the Swiss Fastness Committee has been able to play, by its initiative and its work of intermediation, in the international standardization of color fastness testing.

May this spirit of unprejudiced and willing cooperation remain a force in the future. We need it for understanding among the nations in great things as in small.

Employment Register

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from and filed with, the secretary of the Association, Post Office Box 28, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the secretary.

56-12

Education: B S, New Bedford Institute of Textiles and Technology, 1950.

Experience: Dyer, chemist and plant chemist—dyeing and finishing natural and synthetic fibers.

Age: 31; married; references; Northeast preferred; position — textile chemist, technical sales and service, dyer.

AATCC Calendar

COUNCIL
Nov 16, Jan 18 (New York); Mar 29 (Roanoke, Va); June 7 (New York)

NATIONAL CONVENTIONS
Nov 14-16, 1957 (Hotel Statler, Boston); 1958 (Hotel Conrad Hilton, Chicago); 1959 (Sheraton Park and Shoreham Hotels, Washington, D C); 1960 (Philadelphia, Pa); 1961 (Buffalo, NY)

MID-WEST SECTION
October 27, February 16 (Hotel Bismarck, Chicago, Ill)

NEW YORK SECTION
Nov 16 (Kohler's Swiss Chalet, Rochelle Park, NJ); Jan 23, Mar 1 (Hotel Delmonico, New York, NY); Apr 26, May 24—ladies nite (Kohler's Swiss Chalet, Rochell Park, NJ); June (Annual Outing)

NIAGARA FRONTIER SECTION
Nov 2 (Buffalo, NY); Nov 17 (joint ladies night with CATCC at Hamilton, Ont); Dec 7, Jan 11, Mar 15 (Buffalo, NY); Apr 5 (joint meeting with CATCC at Kitchener, Ont)

NORTHERN NEW ENGLAND SECTION
Dec 1 (Annual Meeting—Hotel Vendome, Boston)

PHILADELPHIA SECTION
Nov 2 (Drake Hotel, Philadelphia, Pa); Dec 7 (Kugler's Restaurant, Philadelphia, Pa)

RHODE ISLAND SECTION
Dec 6 (Annual Meeting, Johnson's Hummocks Grille, Providence, RI)

SOUTH CENTRAL SECTION
Dec 1 (Hotel Patten, Chattanooga, Tenn)

SOUTHEASTERN SECTION
Dec 8 (Atlanta, Ga)

WESTERN NEW ENGLAND SECTION
Nov 16 (Rapp's Restaurant, Shelton, Conn)

Mid-West

THE Fall Meeting of the Mid-West Section will be held on Saturday, October 27, at the Bismarck Hotel, Chicago, Ill.

The annual election of officers will open the afternoon session at 3:00 PM, following which a paper "Bleaching with Hydrogen Peroxide" will be given by James F Whalen, Jr, of the Becco Chemical Div, Food Machinery & Chemical Corp.

Dinner will be served at 7:00 PM. The evening speaker will be Walter H Hindle, Chemstrand Corp, Decatur, Ala, who will speak on the recently announced Chemnyle process for the dyeing of nylon with acid and direct dyestuffs.

Your Candidates——

(Concluded from page P790)

H GILLESPIE SMITH

Candidate for election as vice president, Southern Region

H GILLESPIE SMITH, American Cyanamid Company's Southeastern manager at Atlanta, Ga, received a BS in chemical engineering from University of North Carolina.

Mr Smith taught chemistry at N C State College and did graduate work in dyeing and bleaching before joining the Grasselli Co as a dyestuff salesman and demonstrator in the South. He has represented Cyanamid's Dyes Department in Charlotte, Chattanooga and Atlanta for the past 23 years.

AATCC Activities—Mr Smith has been active in AATCC for 25 years, in which he held membership in three Sections: Piedmont, South Central and Southeastern. He served as Sectional chairman for two years and for three years as a councilor. He was chairman of the Reservations Committee at the 1954 Convention. Mr Smith was instrumental in the creation of a Sectional scholarship of $500.00 awarded annually to textile chemistry students at Georgia Tech or Auburn.

ELLIOTT MORRILL

Candidate for election as vice president, Western Region

ELLIOTT MORRILL, plant manager and technical director, Indianapolis Plant and Rit Products Division, The Best Foods, Inc, received his formal education at Lombard College and the University of Chicago. He is also a graduate of the Army Industrial and Air War Colleges.

Mr Morrill was employed by Ciba, Geigy and Sandoz before joining Rit Products Corp in 1927. He left Rit Products in 1947 as technical director for active duty with the U S Army. He joined The Best Foods, Inc in 1945 as vice president and technical director, Rit Products Corp. He is the author of several technical papers and a holder of U S and Canadian patents.

AATCC Activities—A member of AATCC since 1925, Mr Morrill is a charter member of the Mid-West Section, which he has served as chairman, vice chairman and councilor. He was chairman of the Technical Program for the 1953 Convention.

HYDROSULFITE AND RONGALITE (R) AFTER 50 YEARS*

A JANSON

Translated by

HERMAN A NELSON

Royce Chemical Company
Carlton Hill, NJ

Foreword

When I saw this article by Dr Janson in *Melliand*, and suggested to Mr Nelson that he translate it, as marking an important anniversary in the history of the development of the vat color industry, it brought back the memory of a happy visit made to the works of BASF shortly before the time about which the author writes. The application chemists of the Indigo Department showed me how to make hydrosulfite and how to use it in dyeing with the new "Künstliche Indigo", artificial Indigo. In those days the hydrosulfite had to be made on the spot and kept fairly stable in alkaline solution. Drs Chambon, Metzger, Sonntag and a few others were untiring in their efforts to help me know everything that was to be known about the new product (Indigo), which made rapid progress in its competition with the natural Indigo on account of its superior regularity of composition. But it is doubtful if the further progress of vat colors would have been as rapid had it not been for the good work done fifty years ago by the inventors of Hydrosulfit fest, anhydrous sodium hydrosulfite.—P J Wood.

FIFTY years ago this year two items, hydrosulfite anhydrous and Rongalite were put on the market and have since become very important in dyeing, textile printing and bleaching.

The introduction of synthetic indigo and indanthrene dyes by the Badische Anilin- und Soda-Fabrik AG of Ludwigshafen am Rhein, Germany, necessitated the development of newer and more active reducing agents to replace the steeping vat and the iron-lime and zinc-lime vats used with natural indigo. With the spread of vat dyeing it became necessary to find standardized reducing agents which could be used in standard amounts as were the new synthetic vat dyes. In order to eliminate as much as possible the waste of dyes, the new reducing agents needed to have a reducing potential which would guard against the over reduction of the leuco dye. Hydrosulfite, which had a history of 190 years industrial use behind it, was found to be a vatting agent which met the above requirements.

The history of the hydrosulfites began with the observation of G E Stahls in 1718 that iron dissolves in sulfurous acid, giving a yellow solution.

In 1789 Berthollet was able to show that no hydrogen was evolved in this reaction.

In 1797 Fourcroy and Vauquelin found other metals such as zinc, for example, which reacted similarly to iron.

In 1825 Schönbein (*1*) investigated these phenomena from a purely qualitative standpoint and found that the reaction of sulfurous acid upon iron or zinc produced a new compound in which the sulfur had a lower degree of oxidation than in sulfurous acid. He also recognized that the new compound removed the color from an indigo solution and that in the presence of air the color returned. Therefore we may say that the discovery of the use of hydrosulfite as a vatting agent is celebrating its 100th anniversary.

In 1873 Schützenberger (*2*) isolated an impure sodium salt of hydrosulfurous acid. He attacked the problem quantitatively and gave the compound he analyzed the name 'hydrosulfite' in the mistaken assumption that the isolated material contained hydrogen.

In 1884 Bernthsen (*3*) righted the error and showed that the compound had the formula $Na_2S_2O_4$. Meanwhile the name 'hydrosulfite' had become so entrenched in lay speech that it was not deemed advisable to select another name merely to correct a scientific error.

The hydrosulfite obtained by Schützenberger by reacting zinc with a sodium bisulfite solution was precipitated by the addition of alcohol as $Na_2S_2O_4.2H_2O$. This crystallized into beautiful yellow, shining needles, but it was extremely unstable in air. At the beginning of the stormy development of vat dyeing at the turn of the century, it was packed in soldered drums and delivered in this form in an alcohol slurry by the indigo producers (BASF, MLB Hoechst, and L Cassella) to their dyestuff customers. Handling such an unstable substance, which could react and burn in air, was very troublesome and even dangerous.

Two chemists, Bazlen and Wolf (*4*) in 1904 discovered a process for making *anhydrous* hydrosulfite in a form unusually stable to air. In this process the unstable hydrated crystalline hydrosulfite is heated above its dehydration temperature in alkaline alcohol with the addition of a salting-out agent. After the dehydration the hydrosulfite precipitates out of the mother liquor as a white anhydrous product stable to air.

After the installation of manufacturing facilities, the first Hydrosulfite, conc BASF was put on the market toward the beginning of 1906. The first production was announced in January 1906. BASF gave a two-year guarantee on the stability of its material, and it is worth noting that a sample stored at Ludwigshafen for 30 years had decreased in strength only 10%. Another sample stored 50 years and whose packing was damaged during the war had lost only 50% of its strength.

The manufacturing process was modified in 1906 by reacting zinc dust slurried in water with SO_2. The zinc was then precipitated with soda ash, filtered and the hydrosulfite in the filtrate salted out as the hydrate by the addition of alcohol and common salt. The crystalline anhydrous hydrosulfite is obtained by heating the hydrate in the mother liquor. Since none of the other processes proposed later could improve upon this method the zinc dust process has provided the world with hydrosulfite for half a century.

Besides those which could not be considered for economic reasons, there were some other processes proposed which were serious competitors. Nevertheless the Kinzelberger process which depended upon the reduction of SO_2 by formic acid was too expensive and operational difficulties were too great in the electrolytic process and therefore the zinc dust process won out over them.

One of the most promising processes was the amalgam process, which was outlined by BASF in 1902 (M Bazlen) (*5*). In this method sodium dissolved in mercury reacts with a sodium bisulfite solution buffered with sodium sulfite. From a purely

*Translated from *Melliand Textilberichte* **37**, No. 1, 98-100 (Jan, 1956).

theoretical point of view this is the simplest and most direct process. The $Na_2S_2O_4$ is obtained immediately as the product of the reaction. Development of this method was first started after the introduction of the Kellner-Castner Process for making sodium amalgam by the electrolysis of NaCl on mercury cathodes. The Bayer-Werke in Leverkusen, the Verein für Chemische und Metallurgische Produktion in Aussig, and the BASF were the ones chiefly interested in this process and, in spite of the technical difficulties involved, tangible results was obtained. BASF was the first to master the difficulties and to replace the 50-year-old zinc dust process by the amalgam process. The hydrosulfite manufactured by the amalgam process has the advantage of giving clear solutions in distilled water because it is free of heavy metals.

Observations made by C Kurz in 1901 added greatly to the understanding of the chemistry of the hydrosulfites. He established that the hydrosulfite became appreciably more stable with the addition of formaldehyde, and for the first time it was possible to reduce at higher temperatures. He recommended the use of a mixture of hydrosulfite and formaldehyde for discharging p-nitraniline red.

Excited by this hint, the chemists Schwarz, Baumann, Sünder and Thesmar (*6*) of the Zündelschen Kattundruckerei in Moscow, found that hydrosulfite formed condensation products with aldehydes and ketones. These produce a mixture of two components, one of which retains the reducing power of the hydrosulfite and the other of which is inactive.

Reinking, Dehnel and Labhardt (*7*), three chemists of BASF, conducted accurate experiments on the condensation products and called the active acid of the reducing group 'sulfoxylic acid'. The reacted mixture of hydrosulfite and formaldehyde was manufactured by Cassella, Hoechst and BASF as the reducing agent for discharge printing. This product was sold by BASF under the name of Eradit (R). The disadvantage of this product was its relatively low reducing value because of its inert components.

Again it was Bazlen who brought about a change by a relatively simple process. He made a product that consisted of the reducing component of Eradit only. This new product was put on the market at the beginning of 1906 as Rongalite. In Balzen's process, zinc dust is reacted with SO_2 and formaldehyde. The co-existing inert component is also transformed by zinc dust into a reducing component. After reacting with caustic soda the zinc oxide is filtered off from the Rongalite solution and the solution is evaporated to produce the solid Rongalite.

Due to the service performed by Bazlen of BASF in the years 1905-6, the reducing agents he created for textile dyeing and printing cannot be equalled or excelled today after 50 years. In addition to the two basic products, hydrosulfite and Rongalite, BASF has put on the market mixtures for special applications and the zinc salt of the acid which is the base of Rongalite. Two of these products are Decrolin (R) and soluble Decrolin. These are used as stripping agents and bleaches. Among the hydrosulfite mixtures, Blankit I (R) and Blankit IA and, for spot cleaning, Burmol (R), find application in the bleachery. The hydrosulfite used in bleaching food products is known commercially as Blankit. Two important mixtures of Rongalite were developed by the applications engineers of BASF. They were Rongalite CL and Rongalite CW, which are printing auxiliaries.

It is obvious that the reducing agents suitable for vat dyeing and printing are now always found among the sulfur-oxygen compounds. Indeed, it seems that these compounds are restricted to the sulfoxylic acids. These acids had not been previously isolated either in the free state or as water-soluble salts. R Scholder and G Denk (*8*) had been able to verify the existence of one of these acids in insoluble cobalt sulfoxylate, but it is unlikely that the sulfoxylic acid was present in a monomeric form. Sulfoxylic acid, H_2SO_2, has been found so far only in addition compounds. In hydrosulfite SO_2 is considered the carrier molecule. Aldehydes and ketones can function in the same way as, for instance, in Rongalite. The urea radical can also function this way as Barnett (*9*) showed in 1910 when, for the first time, he produced formamidine sulfinic acid. Because of its high price and limited application it has never been produced in very great quantities.

1) $H_2SO_2 + SO_2 + 2NaOH \rightarrow Na_2S_2O_4 + 2H_2O$

2) $H_2SO_2 + CH_2O + NaOH \rightarrow HOCH_2 \cdot SO_2 \cdot Na + H_2O$

3) $H_2SO_2 + H_2N\text{-}\underset{\displaystyle NH}{\overset{\displaystyle \|}{C}}\text{-}NH_2 \rightarrow \underset{\displaystyle H_2N}{\overset{\displaystyle HN}{\overset{\displaystyle \|}{C}}}\text{-}SO_2H + 2H^+$

Because the same active group is found in the three types of compounds, it follows that one type can be easily converted in part into another type. One can, as has already been shown, obtain Rongalite and a nonreducing compound by the reaction between hydrosulfite and formaldehyde:

$$Na_2S_2O_4 + 2CH_2O \rightarrow HOCH_2 \cdot SO_2Na + HOCH_2SO_2N$$

According to the work of Raschig, Bazlen and others, the sulfur in both compounds is attached to the carbon. Rongalite can thus be considered as the sodium salt of oxymethane sulfinic acid and the nonreducing component can be considered as the sodium salt of oxymethane sulfonic acid.

Bazlen (*10*) was able to show that this reaction can be reversed if Rongalite and sodium bisulfite are allowed to react:

$$HOCH_2 \cdot SO_2Na + NaHSO_3 \rightarrow Na_2S_2O_4 + HOCH_2SO_2N$$

We were able to show by our own (as yet unpublished) work that formamidine sulfinic acid as a true derivative of sulfoxylic acid by converting its sulfoxylic acid radical into Rongalite:

$$\begin{array}{l} NH \\ \| \\ C\text{-}SO_2H \\ | \\ NH_2 \end{array} + CH_2O + NaOH \rightarrow \begin{array}{l} NH_2 \\ | \\ C{=}O \\ | \\ NH_2 \end{array} + HOCH_2\text{-}SO_2Na$$

Therefore all presently known reducing agents for vat dyeing and textile printing originate from or can be traced back to sulfoxylic acid. Rongalite was first manufactured, not by the reduction of sulfurous acid but by the oxidation of sulfur compounds having a lower degree of oxidation, such as is present in sulfoxylic acid, just as formamidine sulfinic acid resulted from the oxidation of thiourea by hydrogen peroxide.

The work of Bazlen (*11*) and information supplied by Simon and Küchler (*12*) based upon the valuation of the Raman spectrum shows that the constitution of hydrosulfite has a symmetrical structure, ie, it is formed by the joining of the sulfoxylic acid to the bisulfite ion, as must be the case in the reaction of Rongalite with bisulfite, plainly a valance equilibrium:

$$\left[\begin{array}{cc} O & O \\ S & S \\ O & O \end{array}\right]^{--} 2Na^+$$

On account of the similarity of the structural formula with that of dithionate the scientific name for hydrosulfite is dithionite. Thus it is assumed that the dithionite anion is not especially stable in solution but can be easily hydrolyzed. This is especially true if another substance is present which can readily attach itself to the sulfoxylic acid thus formed. This is the case when an aldehyde is added:

$$\left[\begin{array}{c|c} O & O \\ S & S \\ O & O \\ H & OH \end{array}\right] \rightleftharpoons HSO_2 + HSO_3$$

In our opinion the existence of such an equilibrium explains its easy splitting off by the addition of an

aldehyde and, further, that molecular oxygen always reacts with it to form the sulfate instead of the dithionate as one would expect. If the sulfite component is protected before oxidation by the addition of alcohol, then almost stoichiometric amounts of sulfite and sulfate are formed. The sulfoxylate radical is more stable in combination with aldehydes and ketones than in dithionite so that the sulfoxylate can be decomposed only in the presence of heat. This explains the resistance of Rongalite to oxidation by molecular oxygen in the cold.

As we were able to show (*13*), Rongalite reacts with molecular oxygen at higher temperatures to form the sulfate. The sulfur in formamidine sulfinic acid is also converted by molecular oxygen in alkaline solution to the sulfate. Whereas the sulfoxylic acid in dithionite and Rongalite is easily split off by the action of acids, formamidine sulfinic acid is very resistant to acids. Under alkaline conditions the reverse is true. Theoretically this difference is due to rearrangement in the formamidine sulfinic acid molecule at various pH values.

Other reactions of dithionite, Rongalite and formamidine sulfinic acid are due chiefly to the behavior of sulfoxylic acid. The sulfoxylate seems to be quite stable in cold alkaline solutions while at 40-60°C disproportionate amounts of sulfites and sulfides are formed. At this temperature sulfoxylate is very sensitive toward thiosulfate (*14*). Very likely an interchange of sulfur takes place with the formation of thiosulfite which, in turn, decomposes to sodium sulfide and sulfite. In acid solutions two molecules of sulfoxylate unite to form the thiosulfate, which explains the presence of this material in weakly acid solutions of dithionite and Rongalite. Thiosulfate is only obtained by the action of acid upon formamidine sulfininc acid after the solution has first been made alkaline. Only if the formamidine sulfinic acid solution has been first made alkaline will the sulfoxylate group split off. All three compounds are very stable toward reducing agents. Oxidizing agents act upon dithionite and Rongalite as follows: Molecular oxygen always converts the sulfoxylate group into a sulfate. Oxidizing agents of a lower oxidation potential such as those usually present in vat dyebaths form sulfites or the sodium salt of oxymethane sulfonic acid. Medium strength oxidizing agents and strong oxidizing agents form, in both instances, sulfates. A characteristic departure is shown by formamidine sulfinic acid. Due to the fact that it is made from thiourea and H_2O_2 it is stable even toward H_2O_2 in a cold weakly acid solution. It loses its stability, as one would assume from the above discussion, in the presence of alkalies.

The reducing power of hydrosulfites is still determined by the indigo method proposed by Schützenberger in 1873 (*15*) even though other methods, such as the physical method using the polarograph, have been developed. This method has maintained its value during the last 50 years for both the hydrosulfite chemist and the practical dyer because it determines the vatting power, ie, the sulfoxylic acid content of the material tested. The presence of other substances, with the exception of sulfides, does not invalidate the results. The indigo method, based upon the reduction of a measured amount of indigo sulfonic acid, can also be used to determine the reducing power of formamidine sulfinic acid. This is accomplished by adding an aqueous solution of formamidine sulfinic acid dropwise from a burette in the presence of $NaHCO_3$ into a measured amount of a boiling indigo sulfonic acid solution. The indigo content of this solution is known exactly. This method gives very accurate results.

A survey of the development of reducing agents throughout the world speaks well for the quality of the hydrosulfite and Rongalite manufactured by BASF. After the BASF patents expired, manufacturers of these products throughout the world took over the processes virtually unchanged. Considering that the yearly production possibly exceeds 100,000 tons, the development work of Bazlen and other chemists of BASF cannot be rated highly enough.

In spite of the advances made in these reducing agents during the last 50 years, it is no secret that there are still many problems in this field especially in their technical application. One need only be reminded of the sensitivity of Rongalite to atmospheric oxygen complained of by the screen printers (*13*) or of the development of various steam processes or of the dyeing and printing techniques for natural and synthetic fibers to realize that the manufacturers of reducing agents and the hydrosulfite chemists were kept very busy.

These and other problems yet to arise assure us of one thing; the developments in the field of reducing agents of the last 50 years will continue in the future.

LITERATURE CITED

(*1*) *J f pr Chem* **61**, 193 (1854).
(*2*) *Compt rend* **69**, 196-201 (1869).
(*3*) *Lieb Ann* **208**, 142-181 (1881).
(*4*) *German Patents* 106, 529 and 162, 912; BASF.
(*5*) *German Patent* 148-125; BASF.
(*6*) *Bull soc ind de Mulhouse* **73**, 183 (1903).
(*7*) *Ber* **38**, 1069-1080 (1905).
(*8*) *Z f anorg Chem* **222**, 17 (1935).
(*9*) *J Chem Soc* **97**, 63 (1910).
(*10*) *Ber* **38**, 1057-1068 (1905).
(*11*) *Ibid* **60**, 1470 (1927).
(*12*) *Z f anorg Chem* **260**, 161 (1949).
(*13*) *Textilber* **35**, No. 8, S 880-885 (1954).
(*14*) *Ber* **38**, 3833 (1905).
(*15*) *Bull soc chim* (*2*) **19**, 152-156 (1873).

Abstracts

Report on Nonwoven Textiles

Anon, *Textile Organon* **27**, 123-5, August, 1956.

The history of nonwoven textiles in the US dates back to the early 1930s when thermoplastic fibers were partially fused together to form a fabric. Development of the industry then was slow until after World War II; but by 1953, output was estimated at 25,000,000 lbs. The industry's fiber consumption last year was between 50,000,000 and 75,000,000 lbs.

Nonwoven (or bonded web) textiles are defined as those in which a web or mat of parallel, cross-laid or randomly-dispersed fibers is held together by an applied bonding material or by the fusing of self-contained thermoplastic fibers by heat and/or pressure.

Cotton and rayon are the principal, nonthermoplastic fibers used in the production of nonwoven textiles today, although glass fibers, wool, asbestos, sisal and other fibers also are used in this rapidly growing industry. Among the thermoplastic fibers, acetate, nylon, acrylic, polyester, and polyvinyl fibers are finding increasing use. Kraft fibers are also used in blends with other fibers.

The authors describe three different methods of forming the web or mat needed as the starting point in making these textiles. This may be a web, obtained from the conventional cotton-system carding operation, or formed by floating fibers in an airstream and collecting them in random fashion on a mesh screen; or a mat, obtained from a slurry of fibers in water, by a process resembling papermaking.

Once the web or mat is obtained by one of these methods, the nonwoven textile is made by spraying or dipping it in a resin; the binders used are usually various vinyl copolymers, although synthetic rubber latices also are widely employed. The final process consists of drying and curing as necessary.

Another bonding method employed is to use low-melting-point fibers which, when incorporated in the original web, will set the web by the application of heat and pressure. Still another approach is to apply a light coating of solvent, such as dimethyl phthalate, to an acetate staple web, which causes the fibers to soften on the surface and stick when heat-cured.

Color may be obtained in nonwoven textiles in several ways. One method is to introduce the color into the bonding agent. Another way is to dye the web by conventional procedures. Dope-dyed or solution-dyed man-made fibers also may be utilized to obtain the desired color.

The author lists a large number of important end-uses of the nonwoven textiles, ranging all the way from diapers to casket-linings, and including apparel interlinings, tablecloths, curtains, aprons, tea bags, and reinforcement for vinyl sheeting, to mention only a few.

Twelve firms are named as the most important manufacturers of these textiles.—WHC

Flameproofing of Textiles

Anon, *Colourage* **2**, 13-14, 35, July, 1956.

The term "flameproofing" indicates a treatment that makes a fabric unable to propagate flame.

The following properties are desirable in a successful flameproofing agent: it should not degrade the material; it should not crystallize on the surface of the fabric; the hand should not be adversely affected; the weight of the fabric should not be increased more than 15-20 percent; and the product should not be either poisonous or dermatologically harmful.

Flameproofing treatments for cellulosic materials may be classified in two main groups: those that are reasonably fast to washing, and those that are completely removed by washing.

Of the nonpermanent products, borax and boric acid are the most popular. Ammonium dihydrogen phosphate and ammonium sulfamate are also used.

Permanent treatments include modification of the cellulose fiber; precipitation of fire-resistant materials within the fiber; and coating the fabric with a resin containing certain oxides.

The fiber can be modified by esterification with inorganic acids. Mixtures of phosphoric acid with urea or cyanamide are used for this purpose. The "THPC" process developed by the US Dept of Agriculture also falls in this category. Such treatments are likely to produce some loss in tensile strength.

Precipitation methods include treatments with Erifon and Titanox FR (both compounds of antimony and titanium) by padding and drying. These processes also may cause tendering.

Fixation of an oxide on the fabric by resins is limited to coarse fabrics, and a large quantity of material is required, so that the hand is liable to be adversely affected. One method uses antimony oxide in a vinyl chloride-vinyl acetate copolymer.

No satisfactory method for flameproofing acetate is available at present, according to the author.

For nylon, a treatment of thiourea, alone or in admixture with ammonium sulfamate, has been recommended.

The author briefly discusses the theory of the mechanism of flameproofing.—WHC

pH Control in Wool Processing

Technical Correspondent, *Textile Recorder* **74**, #880, 59-60; #881, **52-3** (1956).

The author examines some of the aspects of wool finishing with respect to the effect of pH in the various processes discussed.

In carbonizing with aluminum chloride, the pH of the bath should be adjusted to 1.4-1.6 by addition of hydrochloric acid, to stabilize the aluminum chloride. A suitable indicator (Tropaeoline 00) is recommended to be used.

When wool goods are to be crabbed, the pH should be maintained at 7, or a little on the acid side, to avoid bleeding of dyed goods.

In bleaching with peroxide, pH plays an important part. The author recommends maintaining it at 8.2 to 9.2, using sodium pyrophosphate as stabilizing agent. A low pH stabilizes the peroxide too much and retards the bleaching action, while a high pH releases the oxygen too rapidly.

The author discusses the shrinkage of wool in fulling, both acid and alkaline, and quotes a research report stating that between pH 4 and 10 there is little change in feltability. Below pH 4 increased felting takes place. Above pH 10 the wool fiber is degraded.

In the anti-shrink process for wool, using sodium hypochlorite, careful control is essential to avoid damaging the fiber unnecessarily. A pH of 8.5-10 is suggested.

The use of proteolytic enzymes (trypsin and papain) for non-shrink finishes is also discussed. Here the pH of the liquor must be maintained at a constant figure by the use of suitable buffers.

If wool is chlorinated at less than pH 4, it will dye deeper than untreated wool, according to the author; if chlorinated at over pH 6, it will dye lighter than normal wool.

Ten references to the literature are cited.—WHC

New Light Fastness Tester

Anon, *Textile Mfr* **82**, 260, 264, May, 1956.

A new Xenotest lightfastness testing lamp has been developed by Cassella in Germany. A xenon high-pressure radiator is used as the light source, the radiator having a spectrum, it is pointed out, extremely similar to sunlight in the visible region as well as in the ultraviolet range.

The radiator is surrounded by a double-walled cylindrical "cuvette," made of glass, through which cooling water is passed. The glass filters out the short-wave ultraviolet radiation.

Ten sample-holders are arranged on a revolving turntable rotating at 5 rpm. Samples to be tested are mounted on both sides of the holders, which are rotated 180° after each revolution of the turntable, so that both sides are exposed to the light alternately. In this way 20 samples can be exposed at one time, and a change from light to dark in the ratio of 1:1, which the makers consider desirable, can be obtained. This rotation of the holders can be turned off if desired.

The air surrounding the samples is filtered to remove dust and oil fumes, and the moisture content is increased by passage over moistened wicks.

It is claimed by Cassella that the fading obtained in this lamp on textiles dyed with dyes of various degrees of lightfastness corresponds extremely well with that obtained in sunlight and diffused daylight.

The working life of the xenon radiator is guaranteed to be about 800 hours. The light radiation is said to decrease approximately 10% during the first 100 hours, and from 10 to 15% from 100 to 800 hours. A "Lux hour meter" can be installed on the lamp, if desired, to indicate the gradual decrease of radiation.

A number of safety and control devices are provided to enable users to operate the lamp day and night.—WHC

Application of Cationic Dyes to Orlon Knitwear

Neary, J P and Thomas, R J, *Colourage* **2**, 21-5, July, 1956.

The Orlon fiber is used extensively in jersey, interlock and full-fashioned sweaters as well as in fine-gauge jersey fabrics.

Although the disperse dyes are still used for pastel shades, the cationic dyes are now used exclusively for vir-

tually all medium and heavy shades, as well as for some of the light shades. The cationic dyes recommended include nine "Sevron" dyes as well as seven of the "classical" basic dyes.

Strips of sweater bodies or full-fashioned sweaters, usually of high-bulk Orlon, are dyed in bags, preferably made of Orlon type 81, having a mesh of about ½ inch. Paddle machines of the type used for dyeing half-hose are used.

Tubular jersey fabric is dyed in closed dye becks. It is important that the becks be enclosed in order that a dyeing temperature close to 212°F may be maintained.

Full instructions for preparing the dyebaths and conducting the dyeing operations are included.

In dyeing heavy shades, it is very important that the dyeing temperature be maintained as close to 212°F as possible. In fact, high-temperature equipment may be used advantageously, particularly with a dyeing temperature of approximately 225°F. The dyer should recognize the fact that Orlon type 42 has a limited capacity for cationic dyes. Attempts to "pile on" dyes much in excess of the fiber's capacity are futile.

A typical blend of Orlon and wool is the tubular jersey fabric made of 80% Orlon type 42 and 20% wool.

If the wool is to be dyed and the Orlon left undyed, selected acid dyes are used.

If the Orlon is to be dyed and the wool reserved, selected cationic dyes are employed. Slight staining of the wool can be removed by a treatment with Sulfoxite S.

For union shades, a special dyeing process is recommended. Milling or chrome dyes for the wool are added to the dyebath first, followed by cationic dyes for the Orlon. Full instructions are given. This process also permits of the production of contrasting shades on the two fibers.

Stripping of dyed Orlon, when necessary, can be accomplished by treatment with sodium or calcium hypochlorite.—WHC

What's Happening to Synthetic Fibers

Thomas, P M, *Textile World* **106**, 82-3, Sept, 1956.

The author states that the synthetic fiber picture has changed considerably in the last year. Three new fibers have been announced, and two previously reported have gone into production. Following are the important features of the five fibers:

Verel. This is a modified acrylic staple fiber made by Tennessee Eastman. It is dyed best with premetallized dyes, but disperse and basic (cationic) dyes are also suitable. It blends well with cotton, wool, and other synthetics. Successful uses include flannel suitings, shirtings, men's hosiery, knitted underwear, work clothing, and several industrial applications.

Darlan. This is a staple fiber made by B F Goodrich from a base of vinylidene dinitrile. Light shades are produced with disperse dyes; heavier shades with disperse or cationic dyes, using a carrier. Azoic dyes are employed for dark shades. The principal use to date apears to be in deep-pile women's coats.

Creslan. This staple acrylic fiber of American Cyanamid was previously known as X-51 and X-54. It may be dyed with direct, developed, acid, basic, neutral milling, metallized and disperse dyes. It finds uses in knitwear, sportswear, fleeces, blankets, simulated-fur fabrics, suitings, overcoatings and several industrial fabrics.

Teflon. This Du Pont fiber is made from tetrafluoroethylene. It is described as "one of the most slippery materials known". It is strictly an industrial fiber, used in bearings to reduce friction, pump and valve packings, filter cloths, gaskets, etc. It has a high melting point, and is unattacked by boiling acids, alkalis and organic solvents.

Zefran. This "nitrile alloy" fiber has been announced by Dow Chemical Co., but details of its chemical composition and properties are lacking at the moment.

The principal physical properties of Verel, Darlan and Creslan are listed by the author.—WHC

Dyeing Blends of Acrilan and Wool

Anon, *Du Pont Tech Bull* **12**, 57-62, June, 1956.

Acrilan, trade-mark of the Chemstrand Corp., is a chemicallly modified acrylic fiber which has good affinity for anionic dyes, including acid, chrome and metallized types, good affinity for disperse dyes, and moderate affinity for cationic (Sevron) dyes.

Blends of Acrilan and wool have been publicized considerably for use in both the men's wear and the ladies' wear fields. Procedures for dyeing these blends have been described by the fiber manufacturer, and have been further evaluated by Du Pont's Technical Laboratory.

When dyeing blends of Acrilan and wool, the dyer is faced with problems similar to those associated with the dyeing of blends of nylon and wool, ie, both fibers are dyeable with the same dyes, but their differences in dye affinity usually result in a tone-on-tone effect. When applying dye mixtures, the problem is magnified as different hues may actually be obtained on the two fibers. The "Cation-Transfer System" (*Am Dyestuff Reptr 45*, 34, 1956) has been suggested as a solution to this problem. By this procedure, through the use of a cationic and a nonionic surfactant in the dyebath, acid, chrome, acid-metallized and neutral-metallized dyes can be employed to produce good unions. This is based on the theory that the surfactant cation reacts with the dye anion to form with it a complex or salt which in the boiling bath gradually dissociates to release the dye for absorption by the two fiber components; the nonionic surfactant is a dispersant for the complex.

In employing this procedure, several important factors must be considered, such as proper selection of the dyes, time of dyeing, temperature, etc. A typical example of a dyebath is given, and a list of suitable dyes is suggested, including acid, metallized and top-chromed.

For producing light and medium shades, cationic (Sevron) dyes may be used for the Acrilan and selected neutral-dyeing dyes for the wool. A one-bath, two-step method of dyeing is employed. This is described, and lists of suitable dyes are included. Initially, all of the cationic dyes strike on the wool, but on subsequent boiling they transfer to the Acrilan.—WHC

The New Bleaching Techniques

Hall, A J, *Textile Mercury & Argus* **135**, 62, 64, 67, July 13, 1956.

The purpose of this article, according to the author, is not to give a complete account of bleaching processes but rather to draw attention to developments and suggestions that have been made to simplify and improve the bleaching of various types of fibers.

The two main bleaching agents now available are sodium chlorite and hydrogen peroxide, and it is generally true that the former allows bleaching to be carried out with the lowest costs.

Hypochlorite bleaching is unsuitable for fibers like wool, silk and nylon; such fibers should be bleached with hydrogen peroxide. Cellulose and cellulose-derivative fibers can be bleached with either sodium hypochlorite or hydrogen peroxide, the choice depending on circumstances such as cost and convenience.

Hydrogen peroxide as marketed has a pH of about 6. In bleaching cotton, sodium silicate is usually added as a stabilizer, raising the pH to 9-10. It is now claimed that sodium silicate has two drawbacks: it has a tendency to form insoluble compounds by reacting with calcium and magnesium in the water, and it is hard to remove completely from the bleached fabric. Cal-

cium phosphate (resulting from the interaction of calcium chloride with di-sodium orthophosphate) is recommended by the author as a superior stabilizer.

In bleaching wool with peroxide, the bath is usually raised to a pH of 8-10 by addition of sodium pyrophosphate as stabilizer, and maintained at 45-50°C. The author now describes a new process for bleaching wool blankets in which the pH is adjusted to 3-3.5. The blankets are impregnated with the bleach liquor at 15-20°C, and are piled and allowed to lie for 24 hours, and are then dried.

The author states that the synthetic fibers are more difficult to bleach than other fibers, due to their retention of a yellowish or brownish tint and to the fact that they are hydrophobic. For bleaching nylon, Terylene and Orlon, sodium chlorite can be used, under certain conditions, although it attacks stainless steel and liberates free chlorine dioxide gas. More recently, peracetic acid has been recommended for bleaching nylon.

Sodium chlorite can be used for bleaching wool at pH 3.5, according to a patented cold process which is described.—WHC

Blends of Man-made Fibers (Analysis)

Richardson, W A, *Textile Mfr* **82**, 427-9, August, 1956.

The fibers in a blend are intimately mixed and cannot easily be separated for identification. They have to be identified under the microscope, by relying on differences in appearance and in their reactions towards heat and chemical reagents.

Of the natural fibers likely to be found in blends, cotton, wool and linen are fortunately fairly easy to recognize at sight, and with a little experience, silk and tussah silk can be distinguished from the artificial fibers. These are more regular than the natural ones, and possess fewer morphological features that assist the microscopist, and to identify them he must rely, at least in part, on their behavior in tests that can be performed on a microscope slide.

The most convenient preliminary sorting test is to heat the fibers on the slide. They may shrink, or may melt before charring, when they are classed as thermoplastic. If they char without shrinking or melting, they are non-thermoplastic. If nothing happens at all, they are either asbestos or glass.

The next step is to apply reagents (usually solvents) to the fibers between the slide and the cover-glass. In many mixtures a solvent can be found that will dissolve one fiber and not the other. About the only mixture that cannot be so treated is that of Ardil and Fibrolane.

The author gives a list of ten reagents that may be used in the analysis of a large number of binary fiber mixtures.

Mixtures of wool with Ardil or Fibrolane can be treated with peracetic acid, followed by hot caustic soda. The wool is dissolved, while Ardil and Fibrolane lose only a little weight.

Alkaline sodium hypochlorite solution dissolves readily and completely all protein fibers (with one exception); all other fibers listed by the author are practically insoluble.

Where chemical methods cannot be applied, determinations are often made by counting the fibers of the two kinds under the microscope. The author gives directions for this procedure, which, however, has its limitations.

The author also discusses defects in fabrics investigated at Shirley Institute, caused by accidental mixing of yarns of different composition and by non-uniformity of composition of a nominally uniform blend.—WHC

The Dyeing of Orlon and Orlon Mixtures

Walls, I M S, *J Soc Dyers Col* **72**, 261-6, January, 1956.

The acrylic fiber Orlon, as manufactured by Du Pont, is available both as a continuous filament yarn (Type 81) and as a staple fiber (Type 42). The present paper is confined mostly to a discussion of the properties of Type 42.

Orlon staple has exceptional bulking power and a warm, soft, lofty handle. It is these properties which are responsible for its tremendous popularity, particularly in knitwear, such as sweaters. To accentuate this use, du Pont recently introduced "High-bulk Orlon," which contains a proportion of hot-stretched fiber blended intimately with the normal fiber; in boiling water the stretched fiber shrinks, causing the normal fiber to buckle and give a very voluminous, lofty yarn.

Disperse, basic and acid dyes and certain vat dyes can be used to dye Orlon 42. The dyeing temperature should be either at 95-100° or in high-temperature equipment at 110°C. The author points out that high-temperature dyeing should not be employed when it is important to preserve the lofty handle of the material; also that above 110°C excessive shrinkage of the fiber takes place.

Disperse dyes are applied at 95-100°C with a dispersing agent. Unfortunately they exhaust slowly and do not build up well, but the fastness properties in general are good.

Basic dyes are mainly used for the heavier shades. The wet fastness properties of these dyes are very good; severe washing has little effect.

Acid dyes are applied by the well-known cuprous ion technique, which is described. Only a comparatively small number of acid dyes have good dyeing properties, however. Selected acid milling dyes are among those most suitable. The wet fastness of acid dyes on Orlon is stated to be much better than on wool.

Selected indigoid and thioindigoid vat dyes are applied at 95°C in an alkaline reduction bath with addition of Formosul. The all-round fastness is excellent.

The author gives instructions for carrying out the dyeing processes, particularly when it is important to preserve the soft, lofty handle of the yarn. He describes the dyeing methods used on blends of Orlon/wool, Orlon/viscose and Orlon/nylon, which he states are being increasingly used in both knitted and woven goods.

Eight references to the literature are cited.—WHC

Chemistry and Physics of Ardil

Campbell, R, *Textile Mfr* **81**, 538-40, October, 1955.

The Ardil fiber is made from the seeds of *Arachis hypogaea*, more commonly known as the peanut plant. The kernel of the nut contains about 50 percent oil and 25 percent protein. The oil is first removed, and the protein is isolated from the meal by solution in dilute alkali. A 20-25 percent solution of protein, at pH 12.5, is extruded into a strongly acid, saturated salt solution containing formaldehyde.

The filaments first formed are brittle and readily crumble to powder. They require cross-linking to obtain dry and wet strength and flexibility. Treatment with a 1.5 percent solution of formaldehyde in 22 percent sodium sulfate at 50°C gives filaments that can be washed and dried, and have reasonable dry strength. They are then hardened in a concentrated salt/acid solution of formaldehyde. This treatment makes the fiber resistant to bleaching, dyeing and scouring operations. The flexibility is improved, also the ratio of wet to dry strength.

The moisture regain of Ardil is somewhat higher than that of wool, and the strength of the fiber when wet is reduced nearly 50 percent.

The author discusses the protein-formaldehyde reaction, but states that although much work has been done by various researchers, the chemistry of the reactions involved has not yet been satisfactorily explained.—WHC

News of the Trade

LTI Dedicates Olney Hall

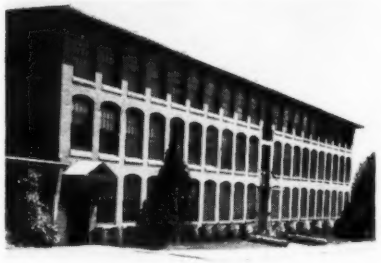
Six honorary doctor of science degrees were awarded at a special academic convocation at Lowell Technological Institute on Sept 27th honoring the memory of Sir William Henry Perkin, discoverer of the first synthetic dye in 1856. Among the dignitaries present to watch the conferral of degrees upon the group were Gov Christian A Herter, who dedicated Olney Hall in memory of Dr L A Olney, 47 years head of LTI's chemistry department and founder of the American Association of Textile Chemists and Colorists, and Rep Edith Nourse Rogers. Raymond W Jacoby, president of the AATCC, delivered the eulogy on Dr Olney.

By his introduction of synthetic dyestuffs into the textile and other industries, Perkin built a vast chemical empire and was the first organic chemist to combine fundamental research and practical application, Dr Herman F Mark told an audience of 1200 in his Perkin Centennial address.

Receiving honorary degrees from Dr Martin J Lydon, president, were Dr Mark, director of the Polymer Research Institute, Brooklyn Polytechnic Institute, "scientist, educator, illustrious leader"; US Senator John F Kennedy, "statesman, philanthropist, public servant, inspiration to his own and future generations"; David F Connors, managing editor, *The Lowell Sun*, "dedicated to the challenge of improving his community"; Sidney M Edelstein, president of the Dexter Chemical Corp, "for exemplifying the nexus between science and the arts"; Fred J Emmerich, president of Allied Chemical and Dye Corp, "successful guide of the destinies of one of the world's largest chemical companies"; and August Merz, American Cyanamid Co, "consultant, humanitarian, highly regarded by men of substance and influence."

National Aniline Opens Akron Office

National Aniline Division, Allied Chemical & Dye Corporation, opened a branch office at 326 South Main Street, Akron, Ohio, on August 15, 1956. The office, which is in the charge of R W Vail, is centrally located in the First Federal Savings Association Building. Akron telephone number is Blackstone 3-9324.



New IDL Quarters in Attleboro, Mass

IDL Moves to Attleboro

Instrument Development Laboratories, Inc, research and development specialists in the field of precision scientific instruments and electronics, and manufacturers of Color-Eye, the electronic color comparator, have moved their main office and factory to Attleboro, Mass.

According to Phillip M Engel, vice president and general manager, the complete administrative, sales, research and development, and manufacturing activities have been transferred from Needham Heights, Mass, to the new location.

IDL was founded in New York in 1946 and moved to Needham Heights in 1949. It is a subsidiary of Royal McBee Corporation, Port Chester, NY. The new location, in the Watson Building on Mechanic Street in Attleboro, affords 27,000 sq ft of space and is said to be part of an expansion program which will see the conversion of IDL products from research to production. IDL research has been concentrated in two major areas: for defense products on instrumentation for aircraft and guided missiles, and for industrial development and manufacture of precision electronic and optical instruments for measurement of color.

Solvay Announces New Prices

Solvay Process Division, Allied Chemical & Dye Corp, has announced revised price schedules on light, intermediate and dense soda ash, snowflake crystals (sesquicarbonate of soda), laundry soda and XX cleansing soda (powdered modified sodas), effective October 1, 1956.

The new schedules fob maker's works are as follows:

		Bulk Per 100	Bags lbs
58% Light Soda Ash	carloads	$1.55	$1.85
58% Intermediate Soda Ash	carloads	1.55	1.85
58% Dense Soda Ash	carloads	1.60	1.90
Snowflake Crystals	carloads	2.10	2.35
Laundry Soda	carloads	1.95	2.25
XX Cleansing Soda	carloads	2.05	2.35

Hollander Acquires Brook Chemical

A Hollander & Son, Inc, Newark, NJ, has acquired for cash the capital stock of Brook Chemical Company and the assets of several affiliated companies.

Brook and the affiliated companies are engaged in the purchase and sale of chemicals, intermediates and dyestuffs for the textile, fur, paper and leather trades and the factoring of accounts of customers. They have heretofore been controlled and managed by Theodore H Boss and will continue to be operated under Mr Boss' management, with no change in business policy, as the Brook Division of A Hollander & Son, Inc. Mr Boss has been elected a vice-president of A Hollander & Son, Inc.

Home Fashions Mission on Tour

On Friday, September 14th, Celanese Corporation of America dispatched on a round-the-world trip its "Home Fashions Mission," believed to be the first commercially sponsored tour activating the new "people-to-people" international program of the United States Government. Comprised of a textile executive and two prominent home furnishings textile designers and decorators, the Mission's assignment was announced by Celanese president Harold Blancke and officially commended by the United States Department of Commerce.

According to Mr Blancke, "During this round-the-world journey our Fabric Style Coordinator and the home furnishings designers will look for home fashion inspiration in the work of craftsmen and artists, and in the stimulus of the country sides, towns and cities of the world. Special attention will be given Spain, France, Denmark and India.

"This Celanese Home Fashions Mission will bring back items for an exhibit designed to inspire textile manufacturers specializing in home furnishings to honor the arts of other countries in their creations. The resultant decorative fabrics will be shown with some of the original inspirational pieces in a vast Celanese Home Fashions promotion in stores all over the country in Autumn 1957. Purpose of this promotion will be to arouse public interest in the home furnishings ideas of other countries."

(L to r): Joseph B Evans, executive vice president, Dexter Chemical Corp; Eduard Farber, chairman of ACS's Division of History of Chemistry; and Ralph E Oesper, winner of the first Dexter Chemical Corporation award for outstanding work in the history of chemistry.

Oesper Wins Award for Work in History of Chemistry

Ralph E Oesper, professor emeritus of chemistry, University of Cincinnati, was presented the first Dexter Chemical Corporation award for outstanding work in the history of chemistry, on Sept 19.

Eduard Farber, American Chemical Society's Division of History of Chemistry chairman, bestowed the award at a luncheon meeting of the division during the society's 130th national meeting.

Joseph B Evans, executive vice president of Dexter, expressed the hope that this award would help to stimulate the interest of both industry and technologists in the history of chemistry.

The annual Dexter award, consisting of a cash prize of $250 and a plaque, was established this year by the Dexter Chemical Corporation, New York.

Dr Oesper, who has been associated with the University of Cincinnati for 38 years, is the author of many papers on colloid, analytical and organic chemistry. In addition, he has written numerous biographies of famous chemists, 24 of which appear in the *Encyclopaedia Britannica.*

His collaboration with foreign chemists in the translation of technical and historical material and his frequent visits abroad have done much to further international good will among chemists. During his long teaching career, he has influenced many of his students to continue their studies in graduate school.

Long active in the American Chemical Society, Dr Oesper has been associate editor of the Society's *Journal of Chemical Education* since 1944. He was selected as eminent chemist for 1953-4 by the Cincinnati Section of the ACS and is a former secretary and chairman of that section. He held similar offices in the Society's Division of History of Chemistry.

ISO Group Adopts Several New Colorfastness Standards

Subcommittee 1 of TC/38 on Textiles, International Organization for Standardization, is preparing to submit proposals for seven new standards for colorfastness, following their adoption by the subcommittee at the meetings in New York's Hotel Biltmore last month.

The adopted standards include those on colorfastness in cross-dyeing, wool; alkaline milling; acid felting, severe; acid felting, mild; bleaching with sodium chlorite, severe; and bleaching with sodium chlorite, mild. A standard for colorfastness of dyed and printed textiles to decatizing was also adopted subject to a minor change to be worked out with delegates of the United Kingdom.

Representatives from the United States and eight foreign countries attended the meetings. A delegation from the USSR, scheduled to attend the meetings, arrived after the sessions had adjourned. The delegation was in attendance throughout the Perkin Centennial celebration, however.

7th Conference, Textile Division of ASQC

The seventh annual conference of the Textile Division of the American Society for Quality Control will be held in Atlanta, Ga, February 25-27, 1957. This meeting will be held in the Harrison Hightower Building of the A French Textile School of the Georgia Institute of Technology.

In connection with the conference, the Textile Division is planning an exhibition of textile testing and quality control instruments and has invited companies manufacturing and/or marketing such instruments to participate. The exhibition will be integrated into the technical program of Textile Quality Control.

Moth Damage Film Offered

Geigy Dyestuffs' 26-minute sound film, "Insects Astray," is now being offered without charge for free showings to consumer groups, home economics and science classes, adult, college and high school audiences, business firms, textile organizations, women's clubs, fraternal organizations, TV stations and others.

The film, which was made in Switzerland, traces the evolution of wool-eating insects from prehistoric days to the present time, pointing out how those insects were once nature's scavengers, but today are highly destructive pests. Microscopic photography is focussed on the ravages of clothes moths, carpet beetles and other wool-eating insects, which cause an estimated $1 billion-a-year damage in the US. The story then shows how this costly, worldwide problem called for the development of durable mothproofing compounds. Geigy's compound, Mitin, is applied to woolen or wool-blend fabrics at the mill, usually during the dyeing stage. The fabric is thereby rendered mothproof for its usable life.

"Insects Astray" was a prize-winner at the Swiss Film Festival, and was chosen to be shown at the Berlin Film Festival and at Chicago's 1956 Golden Reel Festival. The film is available for loan to colleges and high schools, through 51 state university libraries. A complete list of these may be obtained by writing to Mitin Department, Geigy Dyestuffs, Division of Geigy Chemical Corporation, Ardsley, NY.

Television stations—of which some 200 have already shown "Insects Astray"—may obtain copies on loan from Public Service Network, Inc, Princeton, NJ. All other organizations, such as consumer groups, clubs, fraternal organizations, and business firms who wish to borrow the film should write directly to Geigy.

United Aniline Marks 40th Anniversary

United Aniline Co last month marked the 40th anniversary of its formation in 1916, when Louis Aronson, now president of the firm, and Irving B Holtz, a New York importer, entered into partnership to establish offices on Water Street in Boston. Mr Aronson had been a junior salesman in the Northern New England territory for the Brewer Company of Worcester, Mass.

The element of time is said to have played an important part in the success of the infant enterprise, and it realized immediate prosperity. Requirements then were not as rigid as today's demands, and the new organization was capable of not only satisfying consumer wants, but it was beginning to grow.

It was not an easy matter to run a young organization so that it would be successful in customer satisfaction and in its own life as well. Mr Aronson tells of the difficulty imposed on all chemical laboratories at the time for none of today's technical miracles were known. Until 1919, he explained, "we were obliged to expose dyed fabrics to the sun in order to obtain a light test, which was most unsatisfactory because of the limit of the sun hours and the variance in its intensity from week to week and from day to day."

In 1920, Mr Holtz, co-owner of the firm, retired. The business had grown to such proportions that it was necessary to move the firm to larger quarters on High Street, and later to still a larger area on Pearl Street in Boston for the next 25 years. The firm moved to Norwood, Mass, two years ago when its building was to be razed for the city's new highway artery. At its Norwood site, the company's offices, laboratory, and manufacturing units are now housed under one roof.

J O Aronson

L Aronson

Joseph E Travers joined the firm in 1924. Upon his graduation from school, Mr Travers was first associated with the W C Durfee Company and became very well acquainted with German dyestuffs and the testings of these products. This phase of employment offered him a complete knowledge of European colors.

Said Mr Aronson: "We early recognized the opportunity for specializing in the union dyeing field. We devoted our energies to that phase of coloring, and in due time, our knowledge of the dyeing of mixed fibers became well known in the trade. This type of business continued up until World War II when the demand for low-priced fabrics manufactured from cheap blends began to dwindle due to a combination of the Labelling Act and a much higher wage scale.

"We were highly successful in the development of union formulas for the automotive trade, which were outstanding because of their extreme light fastness and even dyeing properties. Within the last few years, the demand for those fabrics has also disappeared, having been replaced with synthetics."

In May of 1955, the vacancy that was caused by the sudden death of Mr Travers was filled by John J Murphy, his assistant for thirty years.

The firm continued to grow in services and another chemist, Walter W Larkin, formerly associated with the American Woolen Company, was added to the ranks of the company's personnel. Mr Larkin's particular job for the firm is to develop formulas to cope with the problems of dyeing blends of wool and Orlon, worsted and Dacron, and many other combinations of natural and synthetic fibers.

The United Aniline Company today services many large mills in the United States and Canada. Besides its home offices in Norwood, it has representative units in Charlotte, NC, and Montreal, Quebec.

The firm is also an agent for colors manufactured by Paul L Miller, Inc, Peerless Color Company, Pharma Chemical Company and the Young Aniline Works.

James O Aronson, son of the founder, is now a vice-president of the company and is in charge of several sales divisions of the firm. He was graduated from Bowdoin College and attended Lowell Textile Institute, specializing in dyeing and finishing.

In addition to its dyestuff and laboratory service for the matching of colors, the company has developed several trade-marked products for use in textile manufacturing and finishing.

• NEW PRODUCTS AND DEVELOPMENTS •

Savagraph Process

A new printing process for cellulosic fibers which employs a new line of vat dyes was described to upwards of 100 management and technical representatives of textile printing firms at a meeting held last month by Du Pont's Dyes and Chemicals Division.

The process, called the Savagraph Process, uses a completely new line of vat colors that have been trademarket Vantasol. It is a further development of the Du Pont Pad-Steam Continuous Dyeing Process adapted to the special techniques necessary for textile printing. The process consists of the compounding of the specially prepared Vantasol vat dye pastes into water-in-oil emulsions and printing and drying of the fabric on standard commercial equipment. The prints are then developed by padding with hydrosulfite and caustic soda followed immediately by a short steaming or flash aging. After oxidation of the prints, the fabrics reportedly need only a mild soaping to produce good fastness.

Douglas C Newman, director of sales of the Dyes and Chemicals Division, listed these advantages: prints have more solid appearance than conventional vat prints, having a dyed effect rather than a printed effect; vat colors printed by this method are frequently more brilliant; hand of the printed fabric is such that only a light soaping is necessary to make the cloth suitable for any type of finish desired; following printing and drying operations, the prints can be stored indefinitely prior to the final development without deterioration; Vantasol colors can be printed in patterns with aniline black and Diagen colors; equipment can be easily cleaned following the printing operation; ease and simplicity of preparing the printing emulsion are operating advantages; good running properties of the emulsion in the printing machine should cause less "down time"; and increased speed of printing has been clearly demonstrated.

A group of fabrics, printed by the Savagraph Process using a range of Vantasol dyes, was exhibited at the meeting. These fabrics had been printed in a commercial plant with commercial patterns to demonstrate the high quality results obtained with the new dyes and process. The prints were clear, sharp, and smooth, resembling dyed effects in the larger objects and blotch areas.

New Breaker-Conveyor Automates Five Manual Handling Operations

Five manual processing and handling operations have been eliminated by installation of a new automatic combination breaker-conveyor for processing chemicals for dyestuffs at Toms River-Cincinnati Chemical Corporation, Toms River, NJ.

The new breaker, which is claimed to be completely dustproof to insure a safe operation, is manufactured by Gifford-Wood Co, Hudson, NY. In operation it feeds large blocks of chemicals into its breaking mechanism, then transfers the material to an automatic screw conveyor, which delivers it to a storage silo.

The equipment is used primarily for processing a dye intermediate. However, it is claimed that the rugged construction of the breaker plus the fact that it is portable and can be moved to other areas, makes it suitable for breaking other chemicals of heavy density.

The chemical is removed from the processing vessel in crystal form and a good percentage of it in large slabs representing crystals that are baked together. These slabs must be broken down into smaller particles to make them suitable for charging through the manholes of processing vessels for further chemical reaction.

Here are some ways the new breaker is reported to have speeded up and improved these operations:

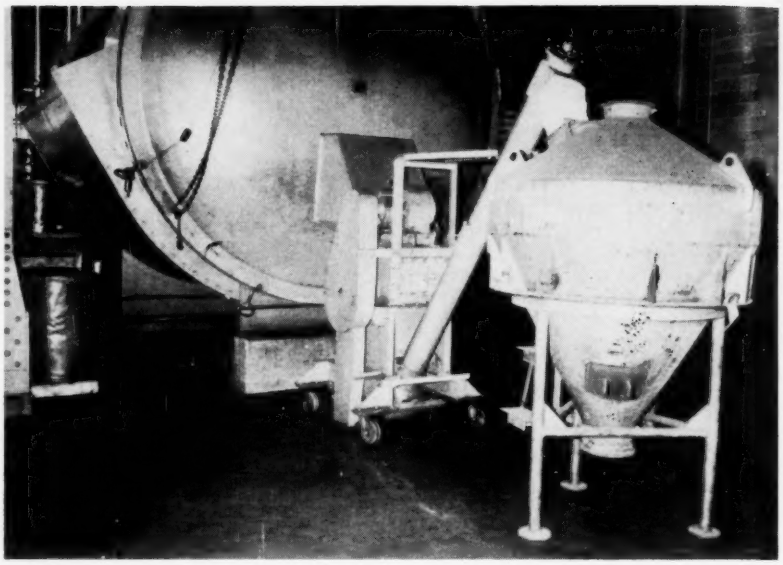
1) *Better Breaking* — When the chemical was fed into Toms River's older crushing equipment, the large blocks of chemical would sometimes shear the crushing mechanism, which had been designed for processing softer products.

Elements of the new G-W breaker, all made of heavy-duty castings, break the chemical into 1½" pieces (ie, able to pass through a 1½" mesh screen). Production rate is reported to be 3,600 lbs per hour, and it is claimed that no breakdown problem has occurred since the equipment was installed.

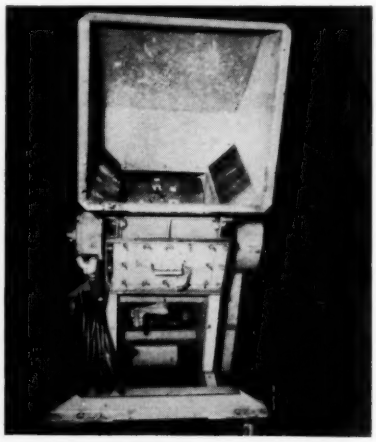
2) *Automatic Breaking-Conveying* —The automatic breaking and conveying features of the breaker are said to have resulted in faster processing and elimination of several transfer operations. When the old stationary crusher was used, the following steps were involved:

a) Caked chemical was shoveled from the reactor into a metal drum.
b) The drum was palletized and moved to the crusher, a distance of about 100 feet.
c) The chemical was loaded manually into the crusher.
d) Following the crushing cycle, material was unloaded into another drum.
e) This drum was palletized and moved to a transfer silo, located in another part of the plant.
f) Chemical was loaded into the silo.
g) The portable silo was transferred to another plant area for further processing.

The new G-W breaker reportedly performs all except the first and last steps automatically. The chemical is fed to the breaker, broken, transferred to the conveyor and delivered to the silo in a single operation.



EQUIPMENT FOR BAKING AND BREAKING CHEMICAL at Toms River-Cincinnati Chemical Corporation. Chemical is baked in reactor (rear) then material is fed into breaker, which breaks it and conveys it to portable silo (front, right).



RECEIVING HOPPER OF G-W AUTOMATIC BREAKER. Breaking drum and pick can be seen inside the breaker. Material passes between drum and cast iron comb. Particles can be broken from 1½" to 4", depending on distance between drum and adjustable comb.

3) *Portability* — Since the new equipment can be used for processing other chemicals, its portability is a useful feature. It can be moved to the processing area of the chemical involved.

4) *Fully Enclosed for Safety*—The only opening is at the receiving hopper where the chemical is fed into the machine.

At the completion of the high-temperature baking in the reactor, the reactor door is opened and the G-W breaker moved into position, with receiving hopper next to the reactor. At the delivery end of the breaker's screw conveyor, a flexible connector is attached to a portable silo positioned beneath it.

Blocks of the product are shoveled into the breaker's enclosed hopper and travel down to the breaking zone. This consists of a motor-driven, cast iron flaker drum with inserted type picks, and an adjustable comb plate. The drum rotates at a speed of 89 rpm; as the picks on the drum move downward, they force the chemical between the comb and drum. Resulting particles are about 1½", although the comb can be adjusted to produce particles as large as 4".

These small pieces then move to a screw conveyor, driven by the same motor as the breaker drum. Conveyor is a 5½" half pitch screw enclosed in a 6" diameter tube, both made of stainless steel. Conveying speed is 50 rpm. Material passes through a delivery opening at the top of the conveyor and through the flexible con-

nector to the portable silo.

The breaker body is 32" long, 20" wide and 34" high and is made of stain-clad steel with welded webs and flanges. All contact parts of the breaker are of alloy steel construction. It is mounted on a channel frame with four swivel casters and two floor locks to hold it in place once it has been positioned for receiving material.

Breaker motor, which drives both the drum and screw conveyor, is housed at the top of the machine. It is a 5 hp explosion-proof Class II Group G motor with starter. Stop-start controls are mounted on a small control panel on the outside of the breaker.

Maintenance of the breaker involves periodic lubrication and washdown when changing over from one chemical to another. Three gasketed cleanout openings in the conveyor, a gasketed removable back plate and a capped drum cleanout on the breaker body facilitate maintenance.

Alkanol HCS

Development of Alkanol HCS was recently announced by Du Pont's Dyes and Chemicals Division.

Alkanol HCS is a nonionic surface-active agent based on an ethylene oxide condensate of a high-molecular weight fatty alcohol. It is said to be an excellent detergent with low foaming properties. This product may be used as a retardant and leveling agent in dyeing processes, a fulling assistant in acid media, and as an emulsifying and dispersing agent of general utility.

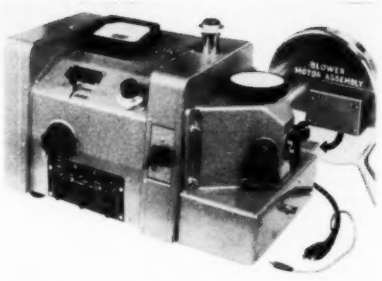
Richsoft 1434, 1439, and 1460

Richmond Oil, Soap & Chemical Co, Philadelphia, reports considerable success in the trade with its three new softeners: Richsoft 1434, Richsoft 1439, and Richsoft 1460.

1434 is anionic, designed to give excellent softening effect on cotton, while 1439 and 1460 are cationic, designed primarily for synthetics, wool and cashmere. 1439 is said also to be extremely effective on Ban-Lon.

All three are reported to show excellent resistance to yellowing at high temperatures, while the main difference between 1439 and 1460 is in the type of resultant hand. 1460 gives a good waxy feel, since it contai lanolin esters, while 1439 imparts a drier full hand.

Technical data sheets on all three are available.



Model C Color-Eye showing blower motor assembly

IDL Dual-Purpose Colorimeter

To provide for color difference determination in temperature-sensitive materials and to make accurate color measurement possible in dusty atmospheres, Instrument Development Laboratories, Inc, Attleboro, Mass, has added a new cooling system and air filter to the Model C Color-Eye.

The Model C Color-Eye is a colorimeter designed for quality control of industrial colors in raw materials and in finished products. It performs the dual functions of an abridged spectrophotometer and a tristimulus colorphotometer in analyzing color formulations, determining metameric conditions and quickly measuring color differences in hue, value and chroma.

The new cooling system reportedly reduces the temperature rise at sample ports and maintains it at a point where rapid analysis of colors on temperature-sensitive materials is possible. The replacement-type filter removes dust from the incoming air to prevent dirt deposition from decreasing the sensitivity of the optics. These new developments are said to give Color-Eye a more universal usefulness and they can be installed on present Model C instruments at the factory. The rear view of Color-Eye shows the small box-like appendage on the right hand side of the case, which houses the blower motor assembly and makes it possible to install the new systems on older type Model C Color-Eyes. This universality is further increased with the availability of the Color Tolerance Computer, which provides a single-value color tolerance from color-difference data.

New Sandoz Products

Sandoz Chemical Works, Inc, 61-63 Van Dam St, New York 13, NY, has released information on several new dyes and a new levelling agent.

Lyogen DK is said to level the varying rates of strike of the different dyestuffs when added to the direct dyebath.

Use of Lyogen DK, Sandoz states, makes it possible for a dyer to obtain a desired shade and properties, without being restricted in choice of dyestuffs by differences in their strike. Sandoz also says that the fastness, tone, and dischargeability of direct dyestuffs are not influenced in any way by the new levelling agent. The chemical has no substantivity for cellulosic material and therefore does not interfere with subsequent processes.

Used with vat dyes, Lyogen DK works in a similar manner. For levelling and penetrating, it is said to be effective in small concentrations. If applied at higher concentrations in a blank vat, it may also be used as a stripping agent.

Lyogen DK is a brown, neutral paste, readily soluble in water. It is mainly nonionic in character, but possesses certain characteristics normally associated with cationic products. It is stable to alkali, acids, and hard water. Details of application are described in Sandoz publication No. 246, "Lyogen DK".

New additions to Sandoz' line include four new Lanasyn (neutral premetallized) dyes, Blue BRL, Brown GL, Orange RL and Yellow 2GL; Diazamine Fast Scarlet 3GWL Pat, the latest fast-to-light diazo scarlet; and Sandothrene Red Brown N2RF Paste Ultrasperse, a new anthraquinone brown.

The new Lanasyn colors are recommended by Sandoz for dyeing of wool, silk, or nylon. Very superior general fastness properties are claimed for these dyes. Samples and technical circulars are available.

Diazamine Fast Scarlet 3GWL Pat is said to excel in brightness, fastness to light, and suitability for discharge work by neutral and alkaline methods. It is especially recommended by Sandoz for the dyeing of cotton and acetate fabrics when a clean acetate reserve is desired. It has the property of covering dead cotton. Diazamine Fast Scarlet 3GWL Pat, developed with beta naphthol, reportedly exhibits good fastness to water, washing, and perspiration, as well as to light. It is said to be highly suitable for treatment with crease-resistant finishes. Leaflet 1282/55, illustrating this new dye, is available.

Sandothrene Red Brown N2RF reportedly yields shades fast to kier boiling and bleaching at minimum cost. A folder, US 208-37, descriptive of this product, is available upon request.

Calcoloid CPS Line

A program to produce an improved line of more than 45 Calcoloid Vat Pastes with controlled particle size, called the Calcoloid CPS line, for maximum efficiency and economy in vat dyeing, has been completed, and the dyes are now available to the textile industry, according to a recent announcement by E G Walker, sales manager of American Cyanamid Company's Dyes Department.

Cyanamid's Calcoloid line, formerly meaning "colloidal" fine dispersion, has been available for 20 years. The new controlled particle size is the newest refinement. It is said to have involved the revamping of processes and equipment, and an even greater emphasis on production control and application laboratory testing.

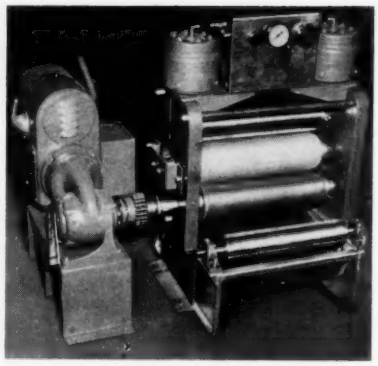
It is claimed that the new controlled particle size vat dye pastes, each dye having its own most efficient size, will mean a new high in trouble-free operation for the dyer. It is further claimed that the controlled particle size vats also have a new maximum high dispersion and excellent working properties, including unexcelled nonspecking, excellent pigment filtration, a negligible content of nonvatable material and the insurance of complete reduction, which is obtained in a few minutes without excessive quantities of reducing chemicals.

It is expected that the improved line of Calcoloid CPS vat dyes will find most usage in fluid paste form. In this form they are also designed to dilute and disperse easily and quickly into dyebath concentration, flow down the side of containers and paddles cleanly, avoiding loss of dye and time. They are said to be nonflaking and nonsettling under normal conditions.

Exhaustive tests are claimed to have shown that the line shows maximum resistance to specking, aggregation and settling in pigment padding of cloth. The dye particles are said to penetrate the cloth thoroughly with excellent reducibility of shades and maximum fastness qualities.

It is stated that the excellent dispersion properties also aid in stock, beam and package dyeing, meaning more uniform dyeings and raw stock that requires less blending, and that these superior dyeing characteristics also apply to jig, skein and other reduced dyeing applications.

Along with individualizing each dye with the ideal particle size, Cyanamid has also inaugurated extensive safeguards to control these sizes during production and afterwards with the company's quality check system.



This laboratory-size model of the patented Niptrol pneumatic mangle is now available for rental to textile mills through Rodney Hunt Machine Co, Orange, Mass. Tests show that results on narrow width pieces run on the laboratory machine are comparable to wider goods run on the full size Niptrol Mangle. A detailed analysis reportedly can be made of dyeing, extracting, and the application of a wide range of finishes. It is said also to be possible to extract and apply finish in one operation with this small unit.

Working roll face is approximately 15". Roll arrangement is very similar to that of the full-scale machine except that the pressure roll is directly loaded by air cells. Due to compensating factors the laboratory model has the same differential between primary and secondary nips as does the large machine. The laboratory unit can be supplied with either a Perlon roll or rubber dye roll, which are interchangeable. Standard laboratory Niptrol units come complete with variable speed drive unit, 110-volt single-phase service, and complete pneumatic control system requiring only connection to an air supply.

50-lb Washer-Extractor

The new Braun Unit Wash combination washer-extractor, 50-lb capacity, has been designed to meet specific washroom needs in the textile industry.

The manufacturer claims that its high efficiency "drop-and-squeeze," gentle wet rub wash action means little tensile strength loss, and positive water temperature control is assured at all times. The unit is claimed perfect for washing woolens as well as cottons, and its gentle wash action is said to make it possible to thoroughly launder synthetics, without pilling or matting. Its size and controlled speed reportedly makes the 50-pound Braun Unit Wash adaptable for dyeing—each cycle giving the load a gentle squeeze which assures maximum penetration of the fibers. It is suggested that the textile industry will find it useful for special treatments of small lots, finishing, coating, sizing, as well as laundering.

Braun Unit Wash

Textile work reportedly is completed in the Braun Unit Wash in 30 minutes, including the wash, extraction and preliminary shake-out. It requires a relatively small amount of floor-space—48" by 44".

Manufactured by G A Braun, Inc, Syracuse, NY, the 50-lb Braun Unit Wash combination washer-extractor has the following specifications: Cylinder Size, 33" by 21"; Cylinder Door Opening, 16½" by 13½"; Wash Speed, 32 RPM; Extractor Speed, 820 RPM; Height, 60"; Wash Motor ¾ HP; Extractor Motor, 3 HP; Water Inlets (2), 2"; Water Outlets (2), 2½". Models are also available in 100- and 200-lb capacities.

XactRay Gauge

The use of automation in measuring and controlling the thickness of cotton batting and felt sheets without touching the material in process is said to insure quantity control within one percent of predetermined standards.

The XactRay Gauge, made by Routh Industrial Gauges, West Englewood, NJ, is a noncontact type employing an X-ray beam whose energy is transmitted through the material being measured. This energy is collected by a receiving unit and converted into electrical impulses, which in turn actuate the electronic equipment in a main console. From the main console equipment it is possible to actuate a large-scale zero-centered meter, a continuous chart recorder or an electromechanical device for actuating sheet rollers, etc, to automatically control the thickness of material being processed.

These gauges operate over wide sheets of material when installed on traversing carriages. Scanning thus can be done manually or automatically and continuously without interfering with processing.

Variations from a predetermined standard weight, density or thickness reportedly can be held to plus or minus one percent.

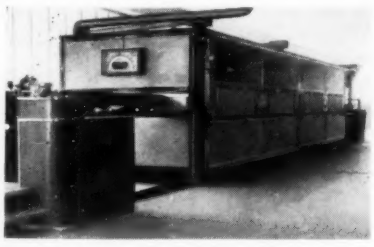
Vits Drying Tenter

The Vits Drying Tenter, now being introduced into the United States by Cosa Corporation, 405 Lexington Ave, New York 17, NY, is said to offer several new improvements in the drying, finishing, curing, polymerizing and controlled shrinking of textile fabrics. This tenter includes the Vits single-jet drying system and a special pin and clip combination. It is said to provide completely uniform treatment of materials at higher speeds—with corresponding savings in labor, power consumption and floor space.

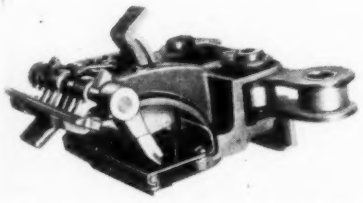
Axial (rather than radial) fans in the single-jet drying section reportedly circulate twice as much air with the same amount of power, while the single jets themselves prevent formation of stagnant air layers or pockets within the tenter. The drying medium mixture of 65% steam and 35% air at 300-400° F is claimed to be specially effective in preventing oxidizing, yellowing, overdrying, or any weakening effect on the fabric. For curing, the temperature can be raised to 500° F.

The combination pin and clip chain operates with automatic changeover in either direction so that any type of fabric can be handled. It is so designed that the fabric is mounted on the pin plate below the pivot of the suspension link, so as to provide better pinning-on of the fabric and avoid undue tension. Another important feature of the clip is the conformation of the faller edge angle to the inclined lip angle. Cloth is introduced between the lip and the faller with a very low impact. Speeds of 300 ypm are reported possible without mechanical difficulty.

The feed end can be provided with mechanical and/or pneumatic edge feelers to permit pinning-on of the fabric at high speeds. It is claimed that this pneumatic edge feeler will also function satisfactorily on light curtain and warp knit fabrics. Overfeeds of 40 to 45% are said to be possible with the Vits overfeeding apparatus. At the delivery end, batching is done immediately over the chains to avoid curling selvages of warp or tricot knit fabrics. A hyperbolic batching unit is an accessory that is a new development for controlling fabric tension on a graduated scale. Specific steam consumption in the Vits Tenter is reported as 1.4 lbs per lb of water evaporated per hour. A 30-ft tenter has an evaporative capacity of about 1300 lbs water per hour.



2-Section Vits Tenter Dryer



Combination pin and clip chain link

Aluminum Formate in Powder Form

Aceto Chemical Co, Inc, 40-40 Lawrence Street, Flushing 54, NY, now has aluminate formate available in powder form. This new material, which reportedly contains 30%-active Al_2O_3, is used for waterproofing of textiles and as a mordant for alizarine dyes.

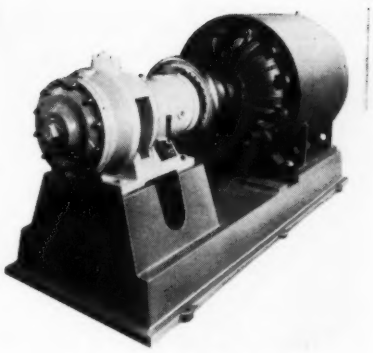
Formic acid is yielded on hydrolysis of the aluminum formate. It is claimed that this acid is volatilized on drying and is much less harmful to textile fibers than the harsh mineral acids formed by hydrolysis of aluminum chloride and aluminum sulfate. It is further claimed that the aluminum formate may be used in combination with paraffin emulsions in the impregnating bath, with the result that the proofing effect of such paraffin emulsions is thereby increased materially. The formate reportedly imports a luminous and attractive appearance to cotton, rayon and synthetics and gives a firmer and crisper feel to woolen gabardines.

Large Production Colloid Mill

Chemicolloid Laboratories, Inc, Garden City Park, NY, manufacturers of the Charlotte Colloid Mill, has announced an advanced colloid mill design which is said to offer 20-40% greater production capacity in heavy production textile, chemical and petroleum applications.

New design features, also available in a range of smaller units, include front end removable shaft seal, which reportedly simplifies maintenance and adjustment of rotary seal for non-abrasive service; flushed seal for abrasive hazardous service; or conventional packing—Teflon or metallic. The colloid mill is fed and discharged under constant pressure, eliminating aeration of the product being handled.

Oversize radial and thrust bearings, which support a rugged shaft that operates at 3600 rpm, greatly minimize down time.



Charlotte Colloid Mill

Distinctive type rotor and stator grooving is said to produce stable emulsions and fine dispersions as well as uniformly suspended solids through a closed continuous system.

Large unit is powered with 125 hp motor and handles viscous materials up to 25,000 lbs per hour. Production on less viscous materials can be obtained up to 50,000 lbs per hour.

Standard material of construction is cast iron with hardened steel rotor, stator and shaft. It is also available in stainless steel of sanitary design.

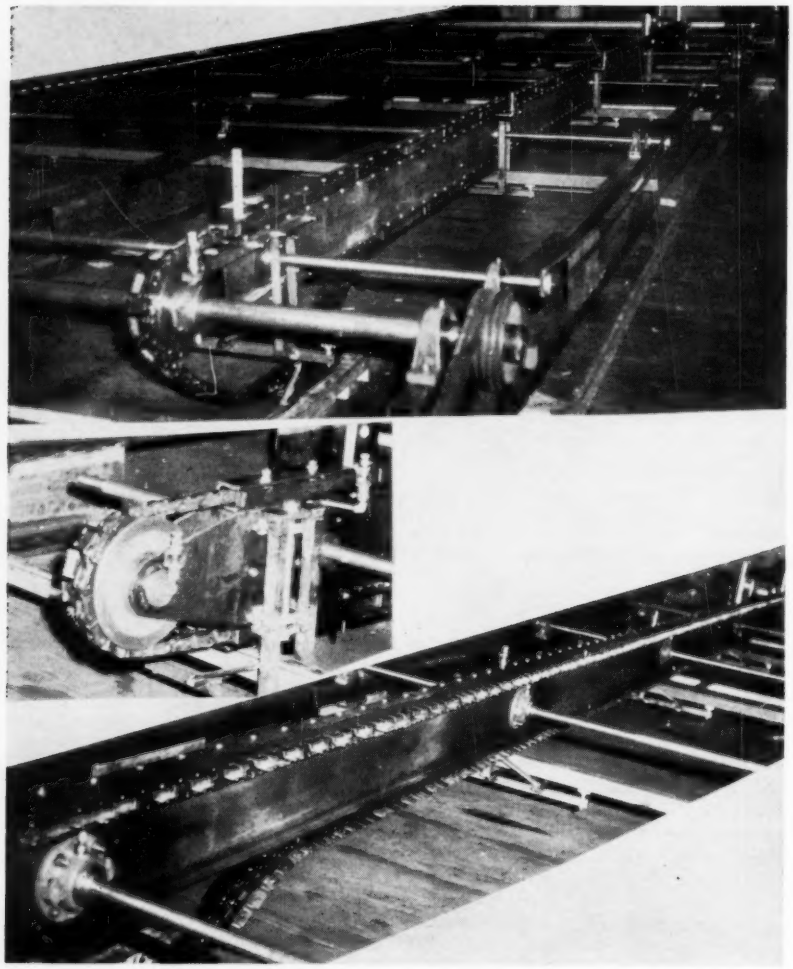
Emkasene

Availability of Emkasene, a new organic sequestering and chelating agent for control of hard water and trace metal ions, has been announced by Emkay Chemical Co, Elizabeth, NJ.

A balanced product, Emkasene is said to be effective in a wide variety of textile processing operations. Claimed to be especially useful in wet processing, Emkasene can be used in boiling, bleaching, dyeing, stripping and finishing operations. It reportedly corrects many conditions that cause dull shades, high bleaching cost, rust stains, low color yields, finish yellowing and rancidity.

Plate Developing Tank

Custom Scientific Instruments, Inc, Kearny, NJ, is now offering the electron microscopist a redesigned Plate Developing Tank, Model CS-6. The stainless steel tank has an overall specification of 11″L x 5″W x 12″H. The cylinders are pyrex with covers and are 2¼″ in diameter. They will handle up to 2″ x 10″ plates. The tank is so arranged to control the temperature of the solution by means of cooling coils. A thermometer reading minus 10 to plus 110°C is furnished.



Three views of STW tentering systems

New Tentering System for Carpeting

A tentering system for carpeting, reportedly the first successful machine of its type in the US, was put into service this year with excellent results.

Originated, designed and developed by engineers of Southern Textile Works, 202 S Towers St, Anderson, SC, the machine is designed to automatically even out and hold straight the edges of carpeting during the curing of latex in the oven, effecting savings for the mill from 3% to 10% by eliminating the waste on the cut edges and prevention of shrinkage during the drying process.

The principal advantage is said to be the "control" of width from the tufter to the finished carpet. Instead of running extra wide material with allowance for shrinkage and cutting, it is now claimed possible to determine the finished width at the tufter.

Southern Textile Works specializes in machines too wide or narrow for standard tenters. The unit is built to a specific job and to fit exactly as required into the existing dryer installation, with a minimum of changes. STW points out that it is not necessary to adapt the process to the machine, rather the tenter is made especially for the job at hand. Each tenter has adjustable width for goods 9′ through 16′ or wider.

It is claimed that the sturdiest type of construction is utilized in the structural members, the unit also being designed for instant response and flexibility. The master control panel is said to give the operator instant control of any phase of the machine's operation. It is pointed out that new, exclusive developments and innovations are definitely to the mills advantage and, production-wise, will assure the maximum output, and most important, "control" over the finished product.

Emboset-Z

Metro-Atlantic Co, Inc, Centredale, RI, reports that its new cyclic urea resin, Emboset-Z, is creating quite a stir in the finishing industry because of its "extremely durable" fiber-reactant properties. It is currently being used on cottons, rayons, and rayon blends.

Emboset-Z is said to display on cottons very low chlorine-retentive properties, demonstrating that discoloration and tensile strength loss is negligible in bleaching. It is claimed to be a superior resin for "minimum care" finishes showing excellent crease resistance and shrinkage control combined with a minimum loss in tensile strength. Emboset-Z is said also to be a highly effective resin for mechanical finishing. It can be used in conjunction with Ranedare-R, Ranedare-S, and Ranedare-C, Metro-Atlantic's durable water repellents for combination finishes.

Emboset-Z on rayon and rayon blends is reported to have demonstrated outstanding crease resistance, shrinkage control, plus the aided feature of a full luxurous hand while maintaining a negligible tensile strength loss.

In addition, Emboset-Z is said to possess excellent storage stability. "Perfect" compatibility is claimed with all the common textile auxiliaries used in thermosetting finishes.

Fade-Resistant Color in Umbrellas

In its new fall line, Crown Umbrella Company of New York has introduced a high-fashion group of umbrellas in 16 solid colors, each of which is said to be highly resistant to the deteriorating effects of both light and atmospheric gases.

Crown's designer, Walter Sackur, has been considering the problem of fading for a long time, since Crown's high-fashion colors can only be achieved through the flexibility provided by piece dyeing, and he reportedly has specified the use of Eastman GLF dyes on all their solid-dyed acetate fabrics. This choice, according to the designer, was based on the success achieved by these dyes in the apparel and home furnishing fields. In addition to affording a high degree of color fastness to atmospheric fumes and light, Crown's fabric, designated "Color-Firm," also exhibits excellent nonshifting properties, it is claimed.

The new line is being manufactured to sell from $5.00.

• NAMES IN THE NEWS •

A recent photo shows George Purdy (right), president of the newly formed Karasell Chemical Corp, and John E Trexise, New England representative for the firm. Both men were formerly with Onyx Oil & Chemical Co for many years.

Offices of the new firm are at 20 Griswold Ave, Providence, RI.

Herbert H Hatch, president of Hatch Textile Research, Inc, New York, commercial textile testing laboratory, marked his forty-eighth year in the textile business last month.

For the past twenty years, Mr Hatch has been a member of the Standing Committee of Commercial Standard CS 59-44, Textiles-Testing and Reporting.

Susan Eastman has been named director of fashion and marketing services for William Heller, Inc, New York.

Miss Eastman has been associated with Celanese Corp of America as fashion coordinator since September, 1955.

E L Timms, Pulverizing Machinery Co, was the featured speaker at the October 11th meeting of the New York Pigment Club at Fraunces Tavern, New York. His subject was "Pigment Pulverizing."

Thomas E Croxson has joined the Research and Development Division of Chemstrand as acting group leader of the Acrilan Dye Application Group.

Mr Croxson previously was associated with Burlington Mills at Dublin, Va, and Wake Forest, NC, and American Aniline at Charlotte, NC.

Commercial development activities of Food Machinery and Chemical Corporation's Westvaco Chlor-Alkali Division have been moved from New York to the Division's largest plant at South Charleston, W Va. The consolidated commercial development and research group is now operating at South Charleston under the direction of **William B Rose**, former development manager and now manager of research and development.

Robert R Dean, former manager of market research, becomes director of the market section of FMC's Westvaco Chlor-Alkali research and development department, handling market research and market development responsibilities. He joined Westvaco in 1953.

Charles H Braithwaite has been named laboratory section director of FMC's Westvaco Chlor-Alkali research and development department. He joined Westvaco in 1951, having previously been with Westinghouse Electric and with the Shell Oil Company.

Al G Draeger becomes director of the engineering section of FMC's Westvaco Chlor-Alkali research and development department. He was with the Victor Chemical Works before joining Westvaco in 1946.

Albert Anson, Jr, has been named manager of the consolidated laboratory services for FMC's Westvaco Chlor-Alkali research and development department. Mr Anson was with the Pennsylvania Salt Manufacturing Company before joining Westvaco in 1940.

Recent scholarship winners at North Carolina State College's School of Textiles include:

Charles F Mauney, $400 Carbide and Carbon Chemicals Company Scholarship; **Ray L Luckenbach** and **Olin E Wilson**, $500 Ciba Co, Inc, Scholarships; and **William R Greene** and **J C Yancey**, $500 Burlington Industries Foundation Scholarships.

Mauney and Luckenbach are members of the NC State Student Chapter, AATCC.

James F Leary has been awarded the $1000 Burlington Industries Foundation Scholarship for his junior and senior years at Lowell Technological Institute. Mr Leary, a member of the LTI Student Chapter, AATCC, is enrolled in the textile chemistry course.

Wellman

Daniels

Connell

Three new department managers have been appointed by the Organic Chemicals Division of American Cyanamid Company.

V E Wellman has been named manager of the petrochemicals department; **R W Daniels** has been appointed manager of the intermediates department, and **P G Connell, Jr**, manager of the rubber chemicals department.

Due to recent substantial growth in the sale of petrochemicals, Dr **Wellman**, who first joined American Cyanamid in 1945, will now devote his entire time to this activity. He was formerly manager of all three departments.

Mr Daniels has been with Cyanamid since 1936. Since joining the company he has served in all phases of developing, producing, purchasing and selling coal tar products and intermediates.

Mr Connell joined Cyanamid in 1946. Since that time he has had extensive experience in both producing and selling activities of the company.

Frederic Dannerth celebrated the fiftieth anniversary of his practice as an industrial chemist and chemical engineer on October 1st.

Dr Dannerth was a member of the General Organization Committee, which was charged with the organization of the American Association of Textile Chemists and Colorants in 1921.

Grant

Appointment of **Charles E Grant** to the newly-created position of manager of solvent sales for Columbia-Southern Chemical Corporation has been announced.

In his new capacity Mr Grant will be responsible for Columbia-Southern sales of trichlorethylene, perchlorethylene, mono-chlorobenzene, ortho-dichlorobenzene and para-dichlorobenzene. Prior to his appointment he had served as manager of market development-chrome chemicals since joining Columbia-Southern in 1955.

The Chemical Sales Division of Chas Pfizer & Co, Inc, has announced four personnel changes in its Brooklyn headquarters organization and its field sales force.

Edward W Marlier, formerly sales representative in the Pittsburgh and Cleveland areas, has been assigned to the headquarters staff of the Industrial Chemicals Department in Brooklyn.

Carl W Lorentzen, who joined Pfizer in 1953 as a chemical sales representative, has been assigned to serve customers in the Pittsburgh and Cleveland areas.

Walter Gropler has been assigned to serve customers in the Metropolitan New York area, and **Simon Sluis** will serve as a representative in the Pacific Northwest area.

Jack H Firpo, vice president of Francolor, Inc, has returned from a two-month visit to the home office, Compagnie Française des Matieres Colorantes, Paris, France, where the outline of the sales policy governing the future of Francolor, Inc, was discussed.

Mr Firpo spent three weeks at the Application Laboratories of CFMC, the factory at Villers St-Paul, and the factories at Oissel and St-Denis.

Obituary

Fred G La Piana

FRED G LA PIANA, who served for many years as director of textile Research for Stein Hall & Co, Inc, died on September 20th after a year's illness. He was 71 years of age.

Mr La Piana was for many years an important figure in Stein Hall's textile development program. He joined the Company in 1925 after serving with both General Adhesive Company and Union Paste Company. His first years with Stein Hall were spent as a sales technician. After this he was sent first to Providence, RI and then Charlotte, NC where he established textile laboratories for the Company. He spent a number of years in Providence as chief chemist and then director of technical research and later was responsible for organizing and directing the movement of the Providence laboratory to its present facilities at Pawtucket, RI. Mr La Piana retired from the Company in 1955 but continued to serve on a consultant basis until his death.

Campbell

General Aniline & Film Corp has announced the promotion of **Kenneth J Campbell** to the newly established position of administrator, general services, Dyestuff and Chemical Division. He will direct the activities of the Credit, Traffic, Advertising, Pricing and Sample Departments.

Mr Campbell first joined GAF 16 years ago. In 1955 he was advanced to administrative assistant to the vice president and general sales manager.

R C Wilson has been appointed special assistant to the manager of manufacturing of the Dyestuff and Chemical Division. He had been a senior chemist in the Process Development Department of the Company's Linden, NJ, plant.

Richard J Nelson has joined GAF as a market research engineer. Since 1952 he has been with Westvaco Chlor-Alkali Division of FMC.

Edgar M Emery and **Joseph W Lyons** have been named to the Analytical Division of the Research and Development Department of the Colgate-Palmolive Company, Jersey City, NJ.

Mr Emery will supervise mass spectrometer analysis. He was formerly with AC&D's Barrett Division.

Mr Lyons, formerly with the American Optical Co, will manage electronic analytical instruments and the application of photography to research problems.

General Calendar

AMERICAN ASSOCIATION FOR TEXTILE TECHNOLOGY, INC
Nov 7, Dec 5 (Both meetings at the Vanderbilt Hotel, New York, N Y).

AMERICAN CHEMICAL SOCIETY (CLEVELAND AND CHICAGO SECTIONS
Nov 27-30 (9th National Chemical, Exposition, Cleveland Public Auditorium Cleveland, Ohio).

AMERICAN OIL CHEMISTS SOCIETY
Spring, 1957 (Spring meeting, New Orleans); Sept 30-Oct 2, 1957 (Fall meeting, Cincinnati); Apr 21-23, 1958 (Memphis); Oct 20-22, 1958 (Chicago); Spring, 1959 (New Orleans); Fall, 1959 (Los Angeles).

AMERIAN SOCIETY FOR QUALITY CONTROL
Feb 25-27—7th Annual Conference of the Textile Division, Georgia Tech, Atlanta, Ga

THE DRYSALTERS CLUB OF NEW ENGLAND
Oct 26 (Hotel Vendome, Boston); Jan 21 (Hotel Somerset, Boston); Apr 26 (Hotel Vendome, Boston); June 21 (Annual Outing —Wachusett Country Club, West Boylston, Mass).

THE FIBER SOCIETY
Spring Meeting—May 1-2, 1957, The Clemson House, Clemson S C

NATIONAL COTTON COUNCIL OF AMERICA
Feb 28-Mar 1 (Cotton Research Clinic, General Oglethorne Hotel, Savannah, Ga).

PHI PSI FRATERNITY
April 25-27—Annual meeting, New Bedford Hotel, New Bedford, Mass

THE QUARTERMASTER ASSOCIATION
Annual Convention — Oct 27-28, Conrad Hilton Hotel, Chicago, Ill.

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION OF THE UNITED STATES
Nov 7 (Palm Terrace Suite, Hotel Roosevelt, New York, N Y).

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